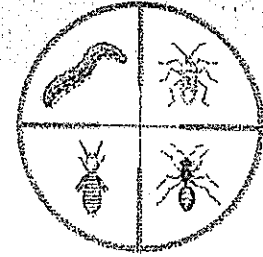




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## Defendant's Expert Disclosure

Joanne Hart and Sandra Bueno, Plaintiffs

VS.

BHH, LLC d/b/a Bell + Howell and VAN HAUSER LLC, Defendants

Case No. 1:15-CV-04804-WHP

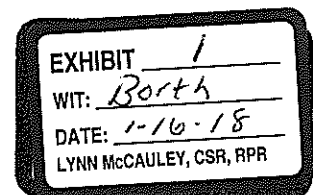
Prepared for

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Prepared by

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October 31, 2017



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# Defendant's Expert Disclosure

## PURPOSE

This document was prepared to evaluate the research reports that BHH, LLC and VAN HAUSER, LLC used to support the entomological claims made on and in the packaging and owner's manual of various of its ultrasonic pest repeller products. The Disclosure includes an assessment of the Plaintiffs' depositions relative to the entomological efficacy of the ultrasonic products cited in their complaint and challenges the validity of certain sections upon which the complaint is founded. Finally, an assessment and opinion(s) of certain allegations made within the Plaintiffs' First Amended Class Action Complaint are provided.

## QUALIFICATIONS

Qualifications for Dr. Paul W. Borth are as follows:

- Board Certified Entomologist since - License #B1799, since 1983
- Defendant's Expert Witness, Galoski v. Stanley Black & Decker, et al., Case No. 1:14-cv-00553
- Member Entomological Society of America – Member No. 00878, since 1979
- Ph.D. Entomology, University of Arizona, Tucson, AZ, 1987
- M.S. Entomology, University of Maryland, College Park, MD, 1981
- B.A. Education, Concordia Teachers College, River Forest, IL, 1975
- 27+ year with Dow AgroSciences in various Research & Development roles focused on crop protection and urban pest management
- 3 years with the University of Arizona's Department of Entomology, Cooperative Extension Service faculty, as Integrated Pest Management Specialist
- Principal, Ento-Centric Consulting since 2015
- CV attached

## NUMBERED LIST OF REFERENCES

The following reference materials were used in preparing this report:

1.	Case 1:15-cv-04804-WHP, Document 62, Filed 01/23/17, First Amended Class Action Complaint, 18 pp.
2	BHH, LLC.000292-000295. Packaging and Owner's Manual, Bell + Howell Ultrasonic Pest Repellers, 3 pack, Night Light w/Switch, Extra Outlet w/Safety Cover, 4 pp.

Page 2 of 23

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3	QMANN Quality Inspection Report# 150437, 3 pp.
4	QMANN Report# 10275-1; Report Date: 2010-11-20; Model Tested: 50153; aka Feuerstein Deposition Exhibit 23, Feuerstein-23.pdf
5	QMANN Report# 10275-2; Report Date: 2010-11-20; Model Tested: 50161; aka Feuerstein Deposition Exhibit 22 (= Exhibit 24), Feuerstein-22.pdf
6	SGS Report#: SZXWT00603439; Date: 23-MAR-2012; Model Tested: not stated; BHH, LLC.000022-000039
7	Intertek Report#: 140515021GXU-002; Date: July 7, 2014; Model Tested: not stated; BHH, LLC.000042-000052
8	Intertek Report#: 160419051GZU-002; Date: April 7, 2016; Model Tested: 50167 (from photo on p. 2); 160419051GZU-002.pdf
9	SGS Report#: AFL20160214GZ-2; Date: May 25, 2016; Model Tested: not stated; SGS-AFL20160214GZ-2 Testing Witness Report Confirm
10	Borth, P. W., 2017, Chi-square Tests of Independence for Six B+H Ultrasonic Pest Repeller Efficacy Tests, 27 pp.
11	Snedecor, G. W. and W. G. Cochran, Statistical Methods, 6 <sup>th</sup> ed., 1973
12	Gomez, K. A. and A. A. Gomez, Statistical Procedures for Agricultural Research, 2 <sup>nd</sup> ed., 1976.
13	Ballard, J. B., R. E. Gold, and T. N. Decker., 1984. Response of German Cockroach (Orthoptera: Blattellidae) Populations to a Frequency Sweeping Ultrasound-Emitting Device. J. Econ. Entomol. 77:976-979.
14	Gold, R. E., T. N. Decker, and A. D. Vance. 1984. Acoustical Characterization and Efficacy Evaluation of Ultrasonic Pest Control Devices Marketed for Control of German Cockroaches (Orthoptera: Blattellidae). J. Econ. Entomol. 77:1507-1512.
15	Koehler, Philip G., R. S. Patterson, and J. C. Webb. 1986. Efficacy of Ultrasound for German Cockroach (Orthoptera: Blattellidae) and Oriental Rat Flea (Siphonaptera: Pulicidae) Control. J. Econ. Entomol. 79:1027-1031.
16	Decker, T. Newell, T. A. Jones, and R. E. Gold. 1989. Auditory Thresholds in the American Cockroach (Orthoptera: Blattellidae): Estimates Using Single-Unit and Compound-Action Potential Recordings. J. Econ. Entomol. 82:687-691.
17	Ballard, James B. and R. E. Gold. 1983. The Response of male German Cockroaches to Sonic and Ultrasonic Sound. J. of The Kansas Entomological Society 56:93-96.
18	Ann E. Koehler, Marsh, Rex E. and, Salmon, Terrell P., Frightening Methods and Devices/Stimuli to Prevent Mammal Damage – A Review (1990). Proceedings of the Fourteenth Vertebrate Pest Conference 1990.50.
19	West, Ben C. and Messmer, Terry A., "Commensal Rodents" (1998). All Archived Publications. Paper 996. <a href="http://digitalcommons.usu.edu/extension_histall/996">http://digitalcommons.usu.edu/extension_histall/996</a>
20	Deposition of Debbie Feuerstein, taken November 29, 2016
21	Deposition of Joanne Hart, taken June 30, 2016
22	Deposition of Sandra Bueno, taken March 9, 2017
23	U.S. Federal Trade Commission. May 3, 2001. FTC Warns Manufacturers and Retailers of Ultrasonic Pest-control Devices

## FINDINGS AND OPINIONS RELATED TO EXEMPLAR PACKAGING TEXT, OWNER'S MANUAL TEXT, AND ASSOCIATED MATERIAL

1. Plaintiffs' complaint contains a photo image of the Bell + Howell Ultrasonic Pest Repellers (3 Pack) with Night Light w/ Switch and Extra Outlet w/ Safety Cover (Note that the B+H Item No. is Not Shown (Ref. 1, page 5 of 18)). However, a photocopy of the front and back of the Package and Owner's Manual for B+H Item No. 50105CD with UPC 5237-00105, copyright 2010 (marked BHH, LLC.000292 – 000295 and listed as Reference 2 in this Disclosure) resembles the image in the complaint. Under the assumption that Ref. 2 is a more complete depiction of what is shown on Page 5 of 18 of Ref. 1, we find within the text these specific phrases:
  1. Packaging
    - o Fast and Effective Ultrasonic sound waves to help repel unwanted pests
    - o Broadcasts various ultrasonic sound waves
    - o Plug in the Ultrasonic Pest Repeller and not block an outlet
    - o Multiple units may be necessary for larger rooms
  2. Owner's Manual
    - o This manual will help you use the Repeller effectively and efficiently
    - o Please read the manual carefully before using the Pest Repeller and keep it on file for future reference
    - o NOTE: Use Ultrasonic Pest Repeller in an average size room, one unit per room
    - o Tips for Increasing Product Efficiency:
      1. Use the Ultrasonic Pest Repeller continuously.
      2. Make sure that all food is put away. The smell of food attracts pests and will decrease the efficiency of the Ultrasonic Pest Repeller.
      3. Repair any openings in your home where pests can get in.
      4. Avoid placing the Ultrasonic Pest Repeller behind large items in your home such as a couch or hutch.
    - o ALL WARNINGS AND SAFETY INSTRUCTIONS SHOULD BE ADHERED TO
    - o The Ultrasonic Pest Repeller should be repaired by a qualified service technician if any of the following has occurred:
      - o ... The Pest Repeller does not appear to operate normally.
      - o Keep these instructions for future reference.

### OPINION(S) - 1

An obligation of any manufacturer, distributor, seller, or marketer (ENTITIES) of an insect pest management product is to provide the end-user with directions and instructions for use of the product so as to achieve the desired results. This obligation is fulfilled with carefully chosen text on the packaging and in the Owner's Manual. It is the burden of the ENTITIES to ensure that the text is

Page 4 of 23

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provided in the native language, using common vernacular, not overly burdensome to read and comprehensible by the typical customer. Striking the best balance between succinctness and overly complex and wordy text is at the discretion of the ENTITIES. In this example and in my opinion, that while the ENTITIES chose to err on the side of succinctness, they have fulfilled their obligation, as described above, when the entirety of the text on the packaging and in the Owner's Manual of this representative B+H Ultrasonic Pest Repeller is considered.

The portions of the packaging and Owner's Manual text that were called out (above) were selected because they represent the operative text instructing the end-user on how to use the product to best achieve the desired results. ENTITIES operate under the assumption that customers will read all text and use the product as instructed. As will be shown below, the Plaintiffs did not follow all of these written instructions. In my opinion, if a customer does not follow the use instructions provided in succinct native language, using common vernacular that is not overly burdensome to read and comprehend, then the customer has defaulted on his/her obligation to use the product in good faith and as intended by the ENTITIES and, therefore, must take full responsibility for the end result be it the desired result that the ENTITIES and customer intended or not.

2. Exemplars Inspected for Packaging and Owner's Manual text

Item No.	UPC 52374-	Description	Copyright
50102CD	00102	B+H Ultrasonic Pest Repellers Complete Home Kit, 2 Micro Design, 2 Classic Design, 2 with Extra Outlet	2013
50103MO	00103	B+H Electromagnetic Ultrasonic Pest Repeller with LED Night Light, AC Outlet & Safety Cover. 1 unit packed in generic brown box, no clamshell packaging with text	2010
50105BCD W-6	00105	B+H Ultrasonic Pest Repellers, Extra Night Light w/Switch, Extra Outlet w/Safety Cover, 3 Pack	2013
50120BCD	00120	B+H Ultrasonic Pest Repellers with Night Light w/Switch and Extra Outlet w/Safety Cover, 4 Pack	2013
50141	00141	B+H Ultrasonic Pest Repeller with Motion Activated LED Night Light	2013
50142BCD	00142	B+H Micro Ultrasonic Pest Repellers with LED Lite, 3 Pack	2013
50153BCD	00153	B+H Electromagnetic Ultrasonic Pest Repellers with Extra Outlet	2013
50177	00177	B+H Electromagnetic Ultrasonic Pest Repellers	2010
50181	00181	B+H Ionic Pest XL, Air Purifier, Pest Repeller, Night Light	2013
50199B	00199	B+H Ultrasonic Pest Repellers, Dusk-to-Dawn Sensor Light, 3 Pack	2010
SB-194	N/A	B+H Ultrasonic Pest Repeller (No clamshell packaging), 6 units individually packaged in generic brown box no clamshell packaging with text; Enclosed with each of 6 is Owner's Manual for Item No. 50192	2013

All Item Numbers examined contained the exact text cited above for Item No. 50105CD or some variation, thereof. Additions or deletions were observed for Item Nos. 50141, 50181, 50105BCDW-6, 50199B, 50142BCD, 50177, SB-194, 50103MO.

### OPINION(S) - 2

Eleven exemplar packages, devices and Owner's Manuals were inspected (listed above). After reading the text on the packages and Owner's Manuals that came with each exemplar, I conclude that the same basic set of instructions was used by the ENTITIES across all Item Numbers to instruct the end-user on its proper use. The textual differences correlate with the various device features that differ from item to item. Given this pattern, it is my opinion that regardless of which B+H Ultrasonic Pest Repeller Item Number was purchased, it would have contained the same basic set of instructions as those called out for Item Number 50105CD in the previous section. Since the PLAINTIFFS' have not produced the Owner's Manual for the Ultrasonic Pest Repellers that are at issue in this case, we must go forward under the assumption that the packaging and Owner's Manual that accompanied each of the devices at issue contained the same basic set of instructions as found on Item Number 50105CD and called out in the previous section.

#### 3. QMANN Quality Inspection Report Style # 50105BCDW-6

This QMANN Quality Inspection Report (Ref. 3) was used to determine and document the ultrasonic functionality of the B+H Ultrasonic Pest Repellers, using Item #50105 as a representative model. In Section 5, "Inspection & Function Test" of that report, we find the two items of most interest when discussing the effect of ultrasonic sound on insects, i.e., Speaker Output (dB) and Electronic Frequency (KHz). The descriptive statistics of those two tests are as follows:

Statistic	Speaker Output (db)	Frequency (KHz)
n	20	20
min	70	43.3
max	78	46.9
mean	73.6	44.8
StDev	2.11	1.30
median	73.5	44.5

### OPINION(S) - 3

In my opinion, the two variables of most interest and consequence when testing and discussing the results of ultrasonic sound on insects are "loudness" of the sound, as measured in decibels (db) and "frequency" of the sound, as measured in kilohertz (kHz). This opinion is borne out in the various published studies on the topic (Ref. 13 – Ref. 17). In the abstract of Ballard, et al. (1984), Ref. 13, we find two statements that are germane to the Hart and Bueno case: 1) "... significantly fewer cockroaches were found in the ultrasonic active cube" and 2) "The results of these experiments suggest that B.

Page 6 of 23

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*germanica* activity was increased by the active ultrasound-emitting device". Within that article we find that they measured the speaker output of the ultrasonic device they were testing at 60 db – 68.5 db and the frequency to sweep between 30 kHz – 65 kHz. When we compare their measurements to those of the B+H Ultrasonic Pest Repeller, Item #50105 we find that the B+H unit is "louder" at 73.6 +/- 2.11 db, on average, and within the same frequency range at 44.8 +/- 1.30 kHz, on average. Also, of interest is Ms. Feuerstein's description of the ultrasonic sound improvements that were incorporated into the B+H Ultrasonic Pest Repeller design over time as from continuous to, "interval output" and "pauses built into the frequency output" (Ref. 20, p. 25, 46). We also find the statement, "Broadcasts various ultrasonic sound waves" on the packaging of B+H Item No. 50105CD and noted above (Ref. 2).

## EXAMINATION OF B+H ULTRASONIC PEST REPELLER EFFICACY REPORTS:

### FINDINGS AND OPINIONS

Six reports of experiments testing the efficacy of B+H Ultrasonic Pest Repellers were submitted for examination and use in this Disclosure Report. Each of these reports was closely examined (Refs. 5-9). Since there were no statistical tests included, the entomological data were extracted for further analysis (Borth, Ref. 10). In each report, the raw data that were selected as being most important to an assessment of entomological efficacy were count data tabulated by pest, experimental day, and treatment. The entomological pests included spiders, roaches, ants, and a combination of pests if they were released into an arena together and at the same time. The experimental day was classified as Pre-Test, Testing, or Post-Test. The Pest Repeller being tested was turned ON during the Testing period and OFF during the Pre- and Post-Testing periods. The two experimental treatments were Pest Repeller ON and Pest Repeller OFF.

To supplement and furnish a basis for objective judgement on the efficacy of the Pest Repellers being tested, a common statistical procedure was employed. The chi-square test of independence is particularly suited for categorical data, especially so when there are only two treatments being compared (Ref. 11 and Ref. 12), as is true in these experiments. Borth summarizes the results of his chi-square testing in this way,

".... When considering all TESTING days, across all experiments, all pests and all pest combinations a total of 136 chi-square tests were run to test the null hypothesis of "no preference". Regardless of the experiment, pest, pest combination, the null hypothesis was rejected at the 5% or 10% level of significance for 124 of the 136 testing days (rejected 91% of the time) ..."

### OPINION(S) - 4

In Ref. 10, I conclude and state this opinion:

Page 7 of 23

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"Therefore, I conclude that: Based upon the conditions in which the Pest Repellers were used in these five choice experiments and using the data reported in the associated research reports, the Pest Repellers can be classified as "efficacious" with a reasonable amount of certainty, given that efficacy is defined as the affectation of pest behavior such that there is a disproportionate number of pests found in an adjoining arena where there is no Pest Repeller."

## Survey of Published Entomological Literature on Ultrasonic Pest Repellers: Findings and Opinions

It is important to know if any of the B+H Ultrasonic Pest Repellers had been tested for efficacy on ants, roaches or spiders and reported in published, refereed scientific journals. Therefore, a search of the keywords, Ultrasonic and Ultrasound, was conducted of The Entomological Society of America (ESA) journal archives. The ESA search revealed only four articles (Refs. 13-16) and they were published between 1984 and 1989 on roaches (none on ants or spiders). The author had in his files a printed copy of a relevant 1983 article published in the Journal of the Kansas Entomological Society (Ref. 17), which he was unsuccessful in accessing online. Examination of the contents of these historical and dated 28 – 34 year old articles revealed that no B+H Ultrasonic Pest Repeller was included in any of the published tests. This fact is important because Koehler, et al. (Ref. 15) state, *"All devices tested produced ultrasound, but the quality of the sound differed for each device."*

The Plaintiffs' First Amended Class Action Complaint (Ref. 1) includes the assertion that, "Scientific evidence shows that B+H Ultrasonic Pest Repellers do not repel pests." Included in their list of pests claimed to not be repelled are "... roaches, spiders, and ants".

### OPINION(S) - 5

It is my opinion that if a scientist wishes to publish research on entomological topics, he/she would do so in the journals of the most logical and preeminent scientific society, where entomological research is easily published and found, those of the ESA. Under this opinion, I conclude that there is no more recent journal publication of the effect of ultrasound on roaches, ants or spiders than those cited and referenced in this Disclosure.

Using Koehler, et al.'s published research (Ref. 15), I opine that: By inference, since B+H Ultrasonic Pest Repellers were not included in any of the published studies and that the quality of sound differs between devices, we cannot extrapolate from the published researchers' conclusions of efficacy or non-efficacy on other ultrasonic devices to any of the B+H Ultrasonic Pest Repellers, because they simply were not tested in the same published experiments.

The search of the ESA's scientific archives revealed no published scientific studies on spiders or ants. It is, therefore, my opinion that the Plaintiffs' allegation that "Scientific evidence shows that B+H Ultrasonic Pest Repellers do not repel pests" when their list of pests includes spiders and ants is untrue and misleading. Furthermore, the only references to scientific studies cited by the Plaintiffs in Ref. 1 relate to rodents (Refs. 18-19), not insects or arachnids.

## FINDINGS AND OPINIONS: DEBBIE FEUERSTEIN DEPOSITION, NOVEMBER 29, 2016, TRANSCRIPTION PAGES 1-223

Ms. Feuerstein testified on the following topics during her deposition (Ref. 20). For brevity and contextual clarity, the author may have taken the liberty of paraphrasing some of the Findings below:

### Product Design Improvements

- p. 25: More precise frequency output, change from continuous output to interval output, improved speaker output (louder);
- p. 44: Some models have 2 speakers for output of 2 different frequencies
- p. 46: Repellers were designed with pauses built into the frequency output, i.e., on/off, on/off

### Product Testing

- p. 30-32: Copies of product tests from 1999-2001 before commercialization are no longer available
- p. 32: These were private tests, not meant to be published in the public domain
- p. 35: the tests on mice, rats, and roaches were supervised by the Head Professor of the Ag Department in Beijing. He supervised the chamber design, protocol and all testing
- p. 99, 181: The repeller works for an average size room, which in America is 200 sq ft
- p. 218: There were no statistical analyses provided by the efficacy researchers or done subsequently.

### Packaging and Owner's Manual text

- p. 54-55: While the art work on the product packaging might be different, the models are the same
- p. 59-62: All claims and use directions were carried forward from previous customers (Sunbeam & First Alert)

## OPINION(S) – 6

The point was made in the previous section that currently available B+H Ultrasonic Pest Repellers cannot be legitimately compared with ultrasonic devices in use and tested decades ago. This point and opinion

Page 9 of 23

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is repeated here in light of Ms. Feuerstein's confirming testimony that Product Design Improvements were, in fact, made over time.

In order for an academic scientist to rise to the level of Head Professor in a University Department, it is my opinion that that individual must be competent, credible, reputable among peers within his own institution and profession, and has a track record of producing reliable scientific studies and conclusions. I suspect that Ms. Feuerstein held the same opinion when she chose the Head Professor of the Ag Department in Beijing to supervise the B+H Ultrasonic Pest Repeller tests.

It appears that Ms. Feuerstein's company operated under the philosophy of changing Item specifications and associated written material when the market demanded it and/or as it received recommendations from customers. Choices such as these are within the purview of the company and, in my opinion, while capable of being criticized by outside entities, remain with the company. As well, the attendant consequences of such choices, whether intended or not, are the company's to live with. The relevancy of this opinion is that Ms. Feuerstein testified that the text on packaging and in the Owner's Manual evolved over time from its first customers. It is not surprising to me, therefore, that the scope, succinctness, etc. of the instructions not quickly evolved from simplicity into a more detailed, complex and wordy set of instructions.

## Plaintiffs' Depositions

### FINDINGS AND OPINIONS: JOANNE HART DEPOSITION, JUNE 30, 2016, TRANSCRIPTION PAGES 1-152

Ms. Hart testified on the following topics during her deposition (Ref. 21). For brevity and contextual clarity, the author may have taken the liberty of paraphrasing some of the Findings below.

#### Compliance with Packaging Text and Owner's Manual (verbatim Instructions in " ")

1. "NOTE: Use Ultrasonic Pest Repeller in an average size room, one unit per room"
  - o p. 10-16: Ms. Hart's home is a 1,205 sq ft ranch house with 6 rooms. Therefore, on average, the size of one room would be ~200 sq ft.
  - o p. 39, 53: Ms. Hart bought 2 sets of Bell+Howell "Sensors". She does not know the model numbers of the devices, but knows they came in a set of 6.
  - o p. 39, 53: Ms. Hart bought one package (of 6) for her brother's "big" house.
2. "Multiple units may be necessary for larger rooms"

- p. 39, 53: Ms. Hart purchased a six-pack of B+H "sensors" for her brother's big house. His house is 3,500 sq ft with 12 rooms. Therefore, on average, the size of one room would be ~291 sq ft/room.
- 3. "This manual will help you use the Repeller effectively and efficiently"
- 4. "Please read the manual carefully before using the Pest Repeller and keep it on file for future reference"
  - p. 61, 69-71: Ms. Hart has not kept the purchase receipt or credit card statement establishing ownership of the devices. Without those items and only her recollection, we are not able to know with certainty the model/style types that she purchased
  - p. 67-68, 136: Ms. Hart does not remember an instruction sheet coming in the package and admits that she did not read an instruction sheet
  - p. 111-112: Ms. Hart does not have a receipt for the second purchase of a 6-pack of Repellers for her brother's house. She does recall that the Repellers were smaller in size than her first purchase and that they had a night light, but did not mention the model number.
- 5. "Use the Ultrasonic Pest Repeller continuously."
  - p. 121-122, 126-128: The Repellers that she used in her brother's house during a visit were removed by her sister-in-law when she departed the home after a visit
  - p. 136-137: The units were not used continuously at her brother's house, but she did use them continuously at her house.
- 6. "Make sure that all food is put away. The smell of food attracts pests and will decrease the efficiency of the Ultrasonic Pest Repeller."
  - p. 137: Ms. Hart stated that she did not put food away at brother's house
- 7. "Avoid placing the Ultrasonic Pest Repeller behind large items in your home such as a couch or hutch."
  - p. 138-139: Ms. Hart claims that she did not install the devices behind large items at either her house or her brother's house.
- 8. "The Ultrasonic Pest Repeller should be repaired by a qualified service technician if any of the following has occurred: ... The Pest Repeller does not appear to operate normally."
  - p. 144: Ms. Hart admits that she did not complain about product performance to HSN or Bell+Howell, nor did she try to contact them.
  - p. 148: Prior to removing the devices and sending them to her lawyer in New York, she did not check to see if the devices were working
- 9. "Keep these instructions for future reference."

In general, Ms. Hart claims she did follow the instructions at her house, but not at her brother's house (p. 138-139)

## OPINION(S) – 7

Based on Ms. Feuerstein's testimony that B+H Ultrasonic Repellers are designed for use in an average size American size room of 200 sq ft (Ref. 20) and the room size calculations based on Ms. Hart's testimony we can conclude that, intentionally or not, she did not violate the room size instruction for her home, but did violate the room size instruction for her brother's home. There is no intention to be more specific as to individual room size, since Ms. Hart did not provide those details.

We do not know from Ms. Hart's testimony whether she used multiple Pest Repeller units in her brother's larger than average size rooms, and in so doing, we do not know if she complied with Instruction 2, above.

Ms. Hart violated Instruction 3, 4 and 9. She testified that she did not read the Owner's Manual, nor did she keep it for further reference. It is, therefore, my opinion that she was derelict in her end-user obligation to explicitly follow the instructions provided by the ENTITIES on proper use to obtain the desired result. There is no way of knowing, had she complied with these instructions, what her satisfaction with the product would have been.

Ms. Hart or her proxy violated Instruction 5 and Instruction 6 at her brother's house, and thereby, in my opinion serves to disqualify any claim that she makes of product performance or her personal dissatisfaction with the product at her brother's house.

Ms. Hart testified that she complied with Instruction 7 at her house and her brother's house.

Regarding compliance with Instruction 8, Ms. Hart states that she did not complain about the performance of the product either to HSN or B+H, therefore, she must have considered them to be operating normally. In my opinion, this implies that she was satisfied with the product performance until such time as she read a mailer from an attorney claiming they were ineffective.

#### Product Efficacy: cockroaches, ants, and spiders

##### When Repellers are not in use

- p. 21-22: When Ms. Hart moved into her home, in 2007, cockroaches, ants and spiders were present in the master bathroom, kitchen and living room. No rodents were present.
- p. 25: After Ms. Hart terminated the contract with Dewey Pest Control, she saw ants and spiders in her home.
- p. 123, 125: Before using the Repellers Ms. Hart saw spiders at her brother's house in the tub 5-10 times.
- p. 132: Over the years 2000-2012-2014, Ms. Hart states that she possibly saw a bug in her house less than 5 times.
- p. 133: After the B+H units were sent to a lawyer in 2014, Ms. Hart has seen grasshoppers, little black bugs, and black widow spiders

Page 12 of 23

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- o p. 148: Since Ms. Hart stopped using the Repellers, she has seen ants and spiders in the house, but no roaches.

#### When Repellers are in use

- o p. 99: Ms. Hart saw ants in the kitchen and bathroom of her home a month or two after plugging in the units.
- o p. 123, 125: After Ms. Hart used the Repellers at her brother's house she did not see any spiders in the rooms in which the devices were in use, except for one spider in the tub after the Repeller was installed.
- o p. 123, 125: Ms. Hart saw spiders in a tub in her brother's house 5-10 times before repeller; but only 1 spider was seen in the tub after the Repeller plugged in. Ms. Hart also saw roaches in the kitchen and service porch after the units were plugged in.
- o p. 134: Ms. Hart saw ants in the master bath several times when the Repellers were plugged in.
- o p. 144: Ms. Hart does not have any photographic evidence to document the type of pest and/or number of pests found in the house, she is relying on her recollection

#### OPINION(S) – 8

This section is an attempt, from Ms. Hart's testimony, to bring to light the cockroach, ant and spider situation in a comparative way between times when the Pest Repellers were in use and when they were not. From the passages of her deposition that are relevant and extracted for further examination (above), in my opinion, there is no way to conduct a legitimate scientific "before and after" analysis. We are left then to characterize the two scenarios with generalizations. In my opinion, the entomological pest pressure in her house and her brother's house is low. For example, seeing a "bug" in her house less than 5 times over the course of 4-5 years is typically not high enough insect pest pressure for homeowners to seek remediation. Seeing spiders in her brother's tub 5-10 times before using the Pest Repellers and then only 1 time when the Pest Repeller was in use is a positive result in favor of Pest Repellers, however, the low pest pressure overall, weakens the argument.

It is this type of non-specific, non-verifiable testimony about product efficacy that forces professional entomologists to rely and base opinions upon scientifically conducted experiments in a laboratory or better yet "field" (Ref. 4) setting to test the efficacy of products such as the B+H Ultrasonic Pest Repellers.

#### Satisfaction with B+H Ultrasonic Pest Repellers

General attitude toward in-home pest control

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- p. 48: In general, Ms. Hart states that she considers pest control to be "satisfactory" if she has to spray an occasional pest
- p. 87-88: Ms. Hart states that she had "bugs coming out of her drain" but didn't do anything about it
- p. 101-102: Before the Pest Repellers were installed, Ms. Hart stated that she sprayed when she saw insects in her home. She did not spray insects after the Pest Repeller was in use.

#### Product satisfaction

- p. 55-56, 63: In general, Ms. Hart states that she has experience returning "a lot of things" either because they (clothes) don't fit or something doesn't work, such as the printer she returned to QVC because it didn't work.
- p. 74, 97-98: After Ms. Hart purchased her first 6-pack of Pest Repellers and plugged them into every room of her house, she made a second purchase maybe "a few days" or "6 months" after the first.
- p. 107: Ms. Hart left the Pest Repellers repellers plugged in her house until she "was told they were ineffective".
- p. 109: Ms. Hart used the Pest Repellers for 8-9 months (with no issue or no complaint call to Customer Service that they were not working) until attorney's mailer claimed they were ineffective.
- p. 123, 125: After using the Pest Repellers at her brother's house she did not see any spiders in the rooms in which they were installed (except for one in the tub).
- p. 124: Even after receiving the lawyer's mailer she kept using the Pest Repellers at her brother's house.

#### OPINION(S) – 9

The content of this section shows that Ms. Hart's behavior is suggestive of a customer that is satisfied with a product, until such time, in my opinion, that it was suggested to her (with a mailer from a lawyer) that the product is ineffective.

In my opinion, Ms. Hart's general attitude toward insect pest control in her home is one of reasonable tolerance. She considers the insect pest control situation to be satisfactory if she only has to spray an occasional pest. Supporting this characterization is her acceptance of "bugs coming out of her drain" and not doing anything to control them.

Ms. Hart is experienced at returning items that "don't work", such as the printer from QVC. If she was not satisfied with the B+H Ultrasonic Pest Repellers that she purchased, why did she not return them of her own volition? Since she did not, I surmise that she was satisfied with the B+H Pest Repellers that were in use in her home. In fact, she purchased a second set of repellers for her brother's house – again implying that she was satisfied with the product. For 8 or 9 months, Ms. Hart used the Pest Repellers without complaint, inquiry, or return until she received the lawyer's mailer that convinced her through,

Page 14 of 23

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in my opinion, the power of suggestion that the Pest Repellers were ineffective. It is revealing that even after receiving the mailer that convinced her that the Pest Repellers in her home were "ineffective", she continued to use them at her brother's house. This is yet another of her behaviors that is suggestive of a satisfied customer.

## Findings and Opinions: Sandra Bueno Deposition, March 9, 2017, Transcription Pages 1-80

Ms. Bueno testified on the following topics during her deposition (Ref. 22). For brevity and contextual clarity, the author may have taken the liberty of paraphrasing some of the Findings below.

### Compliance with Packaging Text and Owner's Manual (verbatim Instructions in " ")

1. "NOTE: Use Ultrasonic Pest Repeller in an average size room, one unit per room"
  - o p. 12: Ms. Bueno described her condominium as 1,200 sq ft, with 6.5 rooms. The average size of one room in her home is, by calculation, ~185 sq ft, apparently laid out in tri-level fashion.
  - o p. 23, 44, 48, 53: Ms. Bueno ordered one B+H Pest Repeller in May 2016 from a Harriet Carter catalog, mainly because of ants. She has a credit card statement showing a purchase from Harriet Carter, but no breakdown of items purchased unless she can get one from Harriet Carter Customer Service
2. "Fast and Effective Ultrasonic sound waves to help repel unwanted pests"
  - o p. 34-35: Used a syringe injector in June/July 2016 to kill the ants in the dining room. She squirted it into the holes and seams of where the dining room wall meets the ceiling. The product must have worked because she hasn't seen ants in the dining room since.
3. "This manual will help you use the Repeller effectively and efficiently"
4. "Please read the manual carefully before using the Pest Repeller and keep it on file for future reference"
  - o p. 54: Ms. Bueno admits that she glanced over the Pest Repeller packaging but did not "read" it.
  - o p. 56: She does not recall there being an insert in the package, which would have been the Owner's Manual.
5. "Use the Ultrasonic Pest Repeller continuously."
  - o p. 61: The unit has been plugged in continuously since the purchase above the kitchen counter that separates the kitchen from the dining room
6. "Repair any openings in your home where pests can get in."
  - o p. 24: Ms. Bueno concluded that the ants were entering her home through a hole in a wall or ceiling, or through a kitchen window.

Page 15 of 23

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- o p. 34-35: Used a syringe injector in June/July 2016 to kill the ants in the dining room. She squirted it into the holes and seams of where the dining room wall meets the ceiling. The products must have worked because she hasn't seen ants in the dining room since.
- 7. "The Ultrasonic Pest Repeller should be repaired by a qualified service technician if any of the following has occurred: ... The Pest Repeller does not appear to operate normally"
  - o p. 71: Did not contact Harriet Carter of B+H or anyone to complain or return the product.
  - o p. 76: She did not test whether the repeller was operating or defective.
- 8. "Keep these instructions for future reference."

### OPINION(S) – 10

Based on Ms. Feuerstein's testimony that B+H Ultrasonic Repellers are designed for use in an average size American size room of 200 sq ft (Ref. 20) and with the room size calculations based on Ms. Bueno's testimony we can conclude that, intentionally or not, she did not violate the room size instruction for her home. There is no intention to be more specific as to individual room size, since Ms. Bueno did not provide those details.

With regard to Instruction 2 above, Ms. Bueno complied (whether intentionally or not) by supplementing the Pest Repeller's effectiveness with the syringe injector to kill the ants in her dining room. Note that Instruction 2 claims that (if used in accordance with directions) the Pest Repeller will "... help repel unwanted pests" (author added the parenthetical statement). Neither the ENTITIES' packaging nor Owner's Manual text claims to solely "control" unwanted; the term "help" clearly suggests that supplementary tactics may be necessary to achieve the desired result.

Ms. Bueno violated, as did Ms. Hart, the Instructions related to acknowledging the Owner's Manual, reading it, and keeping it for future reference (Instructions 3, 4, 8 above). Ms. Bueno testified that she glanced at the packaging but did not "read" it and didn't recall there being an Owner's Manual within the packaging. It is, therefore, my opinion, as in Ms. Hart's instance, that Ms. Bueno was derelict in her end-user obligation to explicitly follow the instructions provided by the ENTITIES on proper use to obtain the desired result. There is no way of knowing, had she complied with these instructions, what her satisfaction with the product would have been.

By her testimony, Ms. Bueno complied with Instruction 5 and Instruction 6, at least so far as the ants seen entering her dining room through the hole in the wall.

Since Ms. Bueno did not have the device repaired by a qualified service technician due to the Pest Repeller appearing to operate abnormally, we must conclude that she either believed that it was operating normally or she did not comply with Instruction 7 and thereby, violated that Instruction.

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Product Efficacy: cockroaches, ants, and spiders

When Repellers not in use

- p. 24: Ms. Bueno concluded that the ants were entering her home through a hole in a wall or ceiling, or through a kitchen window.

When Repellers in use

- p. 23, 44: As of the date of her deposition (March, 2017), Ms. Bueno last saw ants in July 2016, on her dining room wall; she decided to order the Pest Repeller in May 2016 from a Harriet Carter catalog, mainly because of ants.
- p. 27: Ms. Bueno states that she saw roaches one time in the pantry several years ago and used Raid insecticide and traps for roach control.
- p. 30: Ms. Bueno states that she hasn't seen ants or roaches for "months and months"
- p. 62-65: In July 2016 an adjacent neighbor had renovation done by a contractor and Ms. Bueno stated that this caused a "huge problem" with ants entering her home through the dining room wall, across the ceiling and into her kitchen.
- p. 65: The Pest Repeller was plugged in about 5-6 feet from the corner of the dining room where the ants were entering
- p. 75: Ms. Bueno has no photographic evidence that shows the type of pests that were in her house.

OPINION(S) – 11

Ms. Bueno states that she bought the Pest Repeller in May 2016, mainly for ants. But it wasn't until July 2016 that her neighbor renovated and caused the "huge" problem with ants entering through a hole in the dining room wall. This is a curious chronology that makes it difficult to reconstruct a "before and after" insect pest situation from her testimony.

With regard to Pest Repeller efficacy, we read that as of the March 2017 date of her deposition, Ms. Bueno hasn't seen ants or roaches for "months and months". We have no way of knowing with certainty, if this observation is the direct result of the Pest Repeller use, or some other factor. As stated in Opinion – 8, it is this type of non-specific, non-verifiable testimony about product efficacy that forces professional entomologists to rely and base opinions upon scientifically conducted experiments in a laboratory or better yet "field" (Ref. 4) setting to test the efficacy of products such as the B+H Ultrasonic Pest Repellers.

Satisfaction with B+H Ultrasonic Pest Repellers

Page 17 of 23

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- o p. 31: Ms. Bueno states that spiders are not a major issue for her.
- o p. 30: Ms. Bueno states that she hasn't seen ants or roaches for "months and months"
- o p. 69: Ms. Bueno states that between July 2016 and now, only a few ants have been seen intermittently, no roaches, no mice, a couple of spiders.

### OPINION(S) – 12

Ms. Bueno did not specifically testify in her deposition that she either was or was not satisfied with the Pest Repeller. She testified that she did not contact the ENTITITES or a qualified technician for advice or to complain about the product. In my opinion, her behavior suggests that she was satisfied with the B+H Ultrasonic Pest Repeller performance until such time as she received an email about the product from her attorney. Her statements on p. 30 and p. 69 of her deposition also lead to this opinion.

## Characterizing the "Worth" of B+H Pest Repellers: Findings and Opinions

B+H Ultrasonic Pest Repellers and B & H Ultrasonic Pest Repellers are sold via an Amazon.com web page. Amazon provides an option for customers to rate the product using their typical (1 star through 5 star) rating system\*. An analysis of the customers' star ratings was conducted to provide a sense of the "worth" that the purchased product has to that customer, as measured by the Amazon Star Rating system. The findings are below:

- The initial search in the Amazon search box was on keyword (phrase): Ultrasonic Pest Repeller
- Filter on Brands: Bell & Howell, Bell + Howell
- Number of Ultrasonic Pest Repeller Indoor Models with Customer Reviews = 11
- Total Number of Reviews = 2,234
- Number of Verified Purchasers submitting review = 1,997
- Number of Verified Purchasers Rating Product with **5 Stars** = 712 (36%)
- Number of Verified Purchasers Rating Product with **4 Stars** = 271 (14%)
- Number of Verified Purchasers Rating Product with **3 Stars** = 196 (10%)
- Number of Verified Purchasers Rating Product with **2 Stars** = 179 (9%)
- Number of Verified Purchasers Rating Product with **1 Star** = 356 (18%)

For the 11 Bell and Howell Ultrasonic Pest Repeller Indoor models returned from the search, 2,234 customers ascribed "worth" to the product with a Star rating. Of those total reviewers, 1,997 (89%) were verified as purchasers of the product by Amazon. Under the assumption that the population of

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Verified Purchasers rated their products in the same proportion as the population of Total Reviewers, we can determine the number of Verified Purchasers that rated their product with 5, 4, 3 ... stars.

If we stipulate that a "3 Star" rating is "neutral", i.e., has no positive or negative worth, we can focus on the number of verified purchasers ascribing positive and negative worth to the product. Of all verified purchasers, 983 (50%) rated their products with a 4- or 5-star rating vs. 535 (27%) rating their products with a 1- or 2-star rating.

\*copied from the Amazon website:

*"Amazon calculates a product's star ratings using a machine learned model instead of a raw data average. The machine learned model takes into account factors including: the age of a review, helpfulness by customers and whether the reviews are from verified purchases."*

### OPINION(S) – 13

In my opinion, the use of the Amazon 1-5 star rating system to establish customer satisfaction should be treated as "an extra data point", i.e., not to be given the same scientific weight or value as the experiments cited in Refs. 4-8, 13-17, but certainly should not be completely discounted either. Many criticisms of these and other Amazon survey results could be made. If this "data point" were the only data cited to support the efficacy and satisfaction with the product, my opinion would not be the same as stated. But it is not the only "data point" cited. When considered in concert with the other Findings, it brings another dimension to the argument that the B+H Ultrasonic Pest Repellers claims are justified – at least in the minds of 50% of the verified purchasers who voluntarily expressed their end-user consumer perspective (36% [5-Star] + 14% [4-Star]).

Claiming that B+H Ultrasonic Pest Repellers are "worth-less" (emphasis added) as the Plaintiffs do in their complaint (Ref. 1), simply is not consistent with how 50% of the Amazon verified purchasers rated their B+H Ultrasonic Pest Repeller. "Worth" is a subjective term, and many a case has been argued that the "worth" of something can vary from person to person, population to population. In my opinion, claiming that the products are worth-less is a misleading, gross exaggeration.

## Plaintiffs' First Amended Class Action Complaint: Findings and Opinions

Para 1: Product in question: Bell + Howell Ultrasonic Pest Repellers

Para 2: "Scientific evidence shows that these devices do not repel pests. Defendant's Ultrasonic Pest Repellers are ineffective and worthless."

#### OPINION(S) – 14

Based upon Refs. 4-8, 10, 13 – I reject the allegation that these devices do not repel pests. I opine that these scientific references do show that ultrasonic pest repellers repel insect pests under the conditions in which the devices were tested. The fact that they have been shown to repel insect pests, by definition, means that they are not "ineffective". As argued in Opinions – 13, if they are not ineffective then they have "worth", which likely is defined differently by different persons.

Para 3: "Dozens of studies have shown that the ultrasonic technology does not work."

- The West (1998) and Koehler (1990) articles cited are both non-entomological in nature, instead they discuss commensal rodents and mammals, respectively.

#### OPINION(S) – 15

I have not found, nor have the Plaintiffs cited in their complaint the "dozens of studies" that they claim show that ultrasonic technology "does not work". They cited two references and both deal with non-entomological animals. I have found a total of 5 published scientific studies on the effects of ultrasound on cockroach behavior. After searching the most logical set of archives where such studies would be published, nothing was found in the ESA journals with respect to the effect of ultrasound on ants or spiders. In my opinion, the allegation in Paragraph 3 of the Plaintiff's complaint is a gross exaggeration and misleading. See OPINION(S) – 5 for a more detailed discussion.

Para 4: "FTC has issued multiple letters to, and even instituted several actions against, manufacturers and retailers of these devices."

- The FTC notice was published on May 3, 2001 citing law enforcement actions between 1985 and 1997 that were resolved by consent order.
- FTC warning letters urged ... examin(ation) of advertising and ensure they have competent and reliable scientific evidence to support claims that a product eliminates or repels certain pests.

#### OPINION(S) – 16

While Paragraph 4 is true, we do not know whether BHH, LLC or VAN HAUSER received such a warning letter from the FTC. Regardless, the details of the letter are instructive in this matter. The title of the FTC letter includes the phrase, "Ultrasonic Pest-control". Nowhere on the packaging or in the Owner's

Manual is there a reference to "Ultrasonic Pest-control". Among entomological professionals, "control" has a different meaning and different practical connotation than "repel". In my opinion, it is debatable as to whether the FTC warning letter applies to the B+H Ultrasonic Pest Repellers, since they do not claim to provide "control" and may only "help" repel unwanted pests.

Furthermore, in the body of the FTC letter we find that the FTC

*"... urge(s) manufacturers and retailers of ultrasonic pest-control devices to examine their advertising and ensure that they have competent and reliable scientific evidence to support claims that a product eliminates or repels certain pests."*

As stated in OPINION(S) – 6, had Ms. Feuerstein been aware of this letter, she likely considered her company to be in compliance with the FTC Warning, since the research upon which she was relying was supervised by the Head Professor of the Ag Department of a Beijing university.

Para 6: "Ms. Hart ... purchased on July 4, 2014 ... and used the devices as directed ..."

#### OPINION(S)- 17

As outlined in my OPINIONS – 7, among other Instruction violations, Ms. Hart did not read the Packaging text or the Owner's Manual, therefore, in my opinion, the assertion that she used the devices "as directed" is false and misleading.

Para 7: "Ms. Bueno ... purchased on May 21, 2016 ... used the device as directed ..."

#### OPINION(S) – 18

As outlined in my OPINION(S) – 10, among other Instruction violations, Ms. Bueno only glanced at the Packaging text, she did not read it, nor did she read the Owner's Manual, therefore, in my opinion, the assertion that she used the device "as directed" is false and misleading.

Para 15: "Scientific Studies Show the Repellers Do Not Work. Utah State University published a study evaluating various methods for removing household rodents."

#### OPINION(S) – 19

This study is completely irrelevant to entomological pests. A thorough reading finds the focus is on mice and rats, there is no mention of insects. Therefore, in accordance with the Purpose of this Disclosure no opinion(s) will be rendered.

Para 16: "University of Nebraska published a meta-analysis of dozens of studies ..."

- After a thorough reading of the reference, we find there is no mention of a "meta-analysis" which is a recognized statistical procedure.
- The "dozens" of studies cited are not of rodents alone – they include studies of many other non-rodent species.
- The publication includes results on MANY other mammals, so the authors' generalizations and conclusions are not based solely on rodents

### OPINION(S) – 20

The content of this reference is completely non-entomological, so I restrict my opinion to the wording in the Plaintiffs' complaint. Since there is no mention of a statistical "meta-analysis" being done by the authors of this article, in my opinion, the Plaintiffs used inappropriate and misleading terminology in this assertion. Furthermore, the conclusions in the article and cited by the Plaintiffs are based on many mammals, not just mice and rats which are the non-entomological pests that should be the focus of the complaint. In my opinion, again, the Plaintiffs' complaint exaggerates the truth and is misleading.

### SUMMARY

It is my opinion that based upon the independent laboratory efficacy testing that I have reviewed on B+H Ultrasonic Pest Repellers, supplemented by my Chi-square analysis of the results, B+H had reasonable basis to conclude that their products would repel cockroaches, spiders and ants when used in accordance with the instructional text that appears on the packaging and in the Owner's Manual.

Based upon Ms. Hart's and Ms. Bueno's deposition testimony, I opine that neither used the B+H Ultrasonic Pest Repeller in accordance with the full complement of manufacturer's use instructions, as provided with packaging and Owner's Manual text. Without acceptable experimental research on the specific B+H Ultrasonic Pest Repellers at issue in this matter, and with the fact that the devices were not used in accordance with the totality of the instructions provided to them, I do not believe that the Plaintiffs' argument that B+H Ultrasonic Pest Repellers are "ineffective" and "worthless" prevails in this case. Further, I opine that the Plaintiffs' behavior as described in their depositions indicates they were reasonably satisfied with the efficacy and worth of their Repellers, and that had it not been suggested to them by attorney(s) that the product was ineffective, they would not have been party to this case.

Considering the totality of my Opinion(s) 1-20 and supporting facts, I come to the conclusion that the basis for the Plaintiffs' complaint is unfounded and their allegations are exaggerated, false, and misleading.

Page 22 of 23

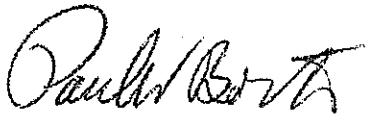
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These opinions are based on the information provided me, thus far. I hold these opinions to be true to a reasonable level of certainty based on my education and experience in the field of entomology and research and development of over 35 years. As additional information is presented, or facts are uncovered, my opinions may change depending on the facts presented.

Dated: October 30, 2017



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Page 23 of 23

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SOLVING PROBLEMS AT THE NEXUS OF SCIENCE, BUSINESS, AND EDUCATION

# Chi-square Tests of Independence for Six B+H Ultrasonic Pest Repeller Efficacy Tests

Submitted in the Matter of:

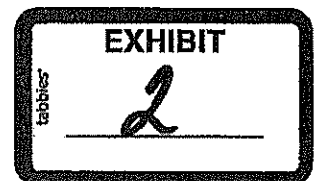
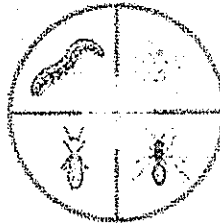
Hart and Bueno v. Bell+Howell and VAN HAUSER  
(Case No. 1:15-CV-04804-WHP)

Prepared by:

Dr. Paul W. Borth, BCE  
Ento-Centric Consulting  
Zionsville, Indiana

October 26, 2017

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Page 1 of 30

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SOLVING PROBLEMS AT THE NEXUS OF SCIENCE, BUSINESS, AND EDUCATION

**Purpose:** These chi-square statistical tests were performed to objectively determine whether the spider, ant and roach count data that were reported in six B+H (or Intellitec) efficacy reports differed significantly from this null hypothesis: *The ultrasonic Pest Repeller, as tested, had no effect on the pest distribution, i.e., the expected ratio between "treated and untreated" during treatment is 1:1 ( $H_0$ : Observed = Expected).* The results of the statistical tests will be used to render an opinion as to the efficacy of the Pest Repeller, under the conditions in which it was tested.

**Statistical Methodology:** The pest count data, as reported within six efficacy reports, were entered into an Excel worksheet and subject those data to the Excel function, CHITEST, re-categorizing as necessary to facilitate statistical testing. As shown in the resulting tables below, the data used in the CHITEST were classified as OBSERVED:EXPECTED by Test Day. In order to standardize statistical treatment across tests, a rule was established that only "living" or "surviving" pests would be considered, thereby, excluding dead or missing insects. Under that rule, the EXPECTED count for each chamber/room for each day of observation equals one half the sum of observed living pests in the treated arena (Repeller ON) and the observed living pests in the untreated arena (Repeller OFF).

**Relevant Pest Repeller Testing Methodology:** The test protocol for each of the six tests examined specified three testing periods: a) Pre-Testing period (2 or 3 days) during which the pests were introduced to the testing arenas for acclimating to "ambient" conditions ... the ultrasonic pest repeller was not turned on, b) Testing Period (7 or 9 days) during which the ultrasonic pest repeller was turned on in one of the arenas, and c) Post-Testing Period (2 or 3 days) during which the ultrasonic pest repeller was turned off to observe the after-effects of the Testing Period on the distribution of pests.

The six efficacy test reports are:

1. QMANN Report# 10275-1; Report Date: 2010-11-20; Model Tested: 50153; aka Feuerstein Deposition Exhibit 23, Feuerstein-23.pdf
2. QMANN Report# 10275-2; Report Date: 2010-11-20; Model Tested: 50161; aka Feuerstein Deposition Exhibit 22 (= Exhibit 24), Feuerstein-22.pdf
3. SGS Report#: SZXWT00603439; Date: 23-MAR-2012; Model Tested: not stated; BHH, LLC.000022-000039
4. Intertek Report#: 140515021GXU-002; Date: July 7, 2014; Model Tested: not stated; BHH, LLC.000042-000052
5. Intertek Report#: 160419051GZU-002; Date: April 7, 2016; Model Tested: 50167 (from photo on p. 2); 160419051GZU-002.pdf
6. SGS Report#: AFL20160214GZ-2; Date: May 25, 2016; Model Tested: not stated; SGS-AFL20160214GZ-2 Testing Witness Report Confirm

## Results and Discussion:

QMANN Report# 10275-1; Report Date: 2010-11-20; Model Tested: 50153; aka Feuerstein Deposition Exhibit 23, Feuerstein-23.pdf (NOTE: TABLE 1 consists of 3 parts: Spiders, Roaches, Spiders+Roaches)

TABLE 1. Chi-square analysis of count data reported in QMANN Report No. 10275-1

SPIDERS	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	IN Rm 3	8	7	
PRE-TEST	NOT in Rm 3 (No repeller)	6	7	0.592980098
Day 2	IN Rm 3	3	6.5	*
PRE-TEST	NOT in Rm 3 (No repeller)	10	6.5	0.052203635
Day 3	IN Rm 3	1	5	**
PRE-TEST	NOT in Rm 3 (No repeller)	9	5	0.011412036
Day 4	IN Rm 3	10	5	**
TESTING	NOT in Rm 3 (No repeller)	0	5	0.001565402
Day 5	IN Rm 3	1	5	**
TESTING	NOT in Rm 3 (No repeller)	9	5	0.011412036
Day 6	IN Rm 3	1	5	**
TESTING	NOT in Rm 3 (No repeller)	9	5	0.011412036
Day 7	IN Rm 3	0	5	**
TESTING	NOT in Rm 3 (No repeller)	10	5	0.001565402
Day 8	IN Rm 3	0	5	**
TESTING	NOT in Rm 3 (No repeller)	10	5	0.001565402
Day 9	IN Rm 3	0	5	**
TESTING	NOT in Rm 3 (No repeller)	10	5	0.001565402
Day 10	IN Rm 3	1	4.5	**
TESTING	NOT in Rm 3 (No repeller)	8	4.5	0.019630657
Day 11	IN Rm 3	0	4	**
TESTING	NOT in Rm 3 (No repeller)	8	4	0.004677735
Day 12	IN Rm 3	0	1.5	*
POST-TEST	NOT in Rm 3 (No repeller)	3	1.5	0.083264517
Day 13	IN Rm 3	1	1	
POST-TEST	NOT in Rm 3 (No repeller)	1	1	1
Day 14	IN Rm 3	1	1	
POST-TEST	NOT in Rm 3 (No repeller)	1	1	1

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ROACHES	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	IN Rm 3	10	10	
PRE-TEST	NOT in Rm 3 (No repeller)	10	10	1
Day 2	IN Rm 3	6	9	
PRE-TEST	NOT in Rm 3 (No repeller)	12	9	0.157299207
Day 3	IN Rm 3	20	10	**
PRE-TEST	NOT in Rm 3 (No repeller)	0	10	7.74422E-06
Day 4	IN Rm 3	11	9.5	
TESTING	NOT in Rm 3 (No repeller)	8	9.5	0.491297124
Day 5	IN Rm 3	2	8	**
TESTING	NOT in Rm 3 (No repeller)	14	8	0.002699796
Day 6	IN Rm 3	2	9	**
TESTING	NOT in Rm 3 (No repeller)	16	9	0.000967428
Day 7	IN Rm 3	2	8.5	**
TESTING	NOT in Rm 3 (No repeller)	15	8.5	0.001616222
Day 8	IN Rm 3	0	7.5	**
TESTING	NOT in Rm 3 (No repeller)	15	7.5	0.000107511
Day 9	IN Rm 3	0	8	**
TESTING	NOT in Rm 3 (No repeller)	16	8	6.33425E-05
Day 10	IN Rm 3	4	8	**
TESTING	NOT in Rm 3 (No repeller)	12	8	0.045500264
Day 11	IN Rm 3	0	7.5	**
TESTING	NOT in Rm 3 (No repeller)	15	7.5	0.000107511
Day 12	IN Rm 3	0	7	**
TESTING	NOT in Rm 3 (No repeller)	14	7	0.000182811
Day 13	IN Rm 3	2	6	**
POST-TEST	NOT in Rm 3 (No repeller)	10	6	0.020921335
Day 14	IN Rm 3	2	6	**
POST-TEST	NOT in Rm 3 (No repeller)	10	6	0.020921335
Day 15	IN Rm 3	3	6	*
POST-TEST	NOT in Rm 3 (No repeller)	9	6	0.083264517

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SPIDERS + ROACHES		Observed	Expected	Chi-Sq P Value
TOTAL	Location	(# Living)	(1/2 of Survivors)	
Day 1	IN Rm 3	18	17	
PRE-TEST	NOT in Rm 3 (No repeller)	16	17	0.731600589
Day 2	IN Rm 3	9	15.5	**
PRE-TEST	NOT in Rm 3 (No repeller)	22	15.5	0.019550269
Day 3	IN Rm 3	21	15	
Uncertain	NOT in Rm 3 (No repeller)	9	15	0.028459737
Day 4	IN Rm 3	21	14.5	
Uncertain	NOT in Rm 3 (No repeller)	8	14.5	0.015776756
Day 5	IN Rm 3	3	13	**
TESTING	NOT in Rm 3 (No repeller)	23	13	8.76994E-05
Day 6	IN Rm 3	3	14	**
TESTING	NOT in Rm 3 (No repeller)	25	14	3.21596E-05
Day 7	IN Rm 3	2	13.5	**
TESTING	NOT in Rm 3 (No repeller)	25	13.5	9.58401E-06
Day 8	IN Rm 3	0	12.5	**
TESTING	NOT in Rm 3 (No repeller)	25	12.5	5.73303E-07
Day 9	IN Rm 3	0	13	**
TESTING	NOT in Rm 3 (No repeller)	26	13	3.41417E-07
Day 10	IN Rm 3	5	12.5	**
TESTING	NOT in Rm 3 (No repeller)	20	12.5	0.002699796
Day 11	IN Rm 3	0	11.5	**
TESTING	NOT in Rm 3 (No repeller)	23	11.5	1.62001E-06
Day 12	IN Rm 3	0	8.5	**
TESTING	NOT in Rm 3 (No repeller)	17	8.5	3.73798E-05
Day 13	IN Rm 3	3	7	**
POST-TEST	NOT in Rm 3 (No repeller)	11	7	0.032509445
Day 14	IN Rm 3	3	7	**
POST-TEST	NOT in Rm 3 (No repeller)	11	7	0.032509445
Day 15	IN Rm 3	3	6	*
POST-TEST	NOT in Rm 3 (No repeller)	9	6	0.083264517

**FROM:**

QMANN Report#: 10275-1; Date:2010-11-20; Model Tested: 50153; Feuerstein-23.pdf; Exhibit 23

**ASTERISK & COLOR LEGEND:**\*\* Chi-Square P Values  $\leq 0.05$ \* Chi-Square P Values  $\leq 0.10$ **Ento-Centric  
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Page 5 of 30

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SOLVING PROBLEMS AT THE NEXUS OF SCIENCE, BUSINESS, AND EDUCATION

Table 1, Part 1 shows that for spiders the Chi-Square P value is less than 0.05 for Days 4-11 when the Pest Repeller was ON and testing was underway. Therefore, for these eight days, we cannot accept the null hypothesis. In other words, the observed ratio of spiders IN ROOM 3:NOT IN ROOM 3 deviates significantly from the hypothesized no-preference ratio of 1:1 at the 5% level of significance for these days. These significant differences suggest that the Pest Repeller did demonstrate efficacy under the conditions in which it was tested. The significantly different ratios in Days 2 – 3 during the Pre-Test are likely artifacts of the protocol and introduction/acclimation of spiders to the testing rooms.

Table 1, Part 2 shows that for roaches the Chi-Square P value is less than 0.05 for all days of Testing (Days 5-12) when the Pest Repeller was ON except for Day 4, which was the first day the Pest Repeller was turned on. Therefore, for these eight days, we cannot accept the null hypothesis. In other words, the observed ratio of spiders IN ROOM 3:NOT IN ROOM 3 deviates significantly from the hypothesized no-preference ratio of 1:1 at the 5% level of significance for these days. These significant differences suggest that the Pest Repeller did demonstrate efficacy under the conditions in which it was tested. There is not enough information available to explain why the observed ratios in Days 13-15 during the Post-Test period are significantly different at the 5% or 10% level.

Table 1, Part 3 shows that when the counts for spiders and roaches are summed for each day the Chi-Square P Value is less than 0.05 for all days when it was certain that Testing was underway and the Pest Repeller was ON (Days 5-12). Therefore, for these eight days, we cannot accept the null hypothesis. In other words, the observed ratio of spiders + roaches IN ROOM 3:NOT IN ROOM 3 deviates significantly from the hypothesized no-preference ratio of 1:1 at the 5% level of significance for these days. These significant differences suggest that the Pest Repeller did demonstrate efficacy under the conditions in which it was tested. As in Table 1, Part 3, there is not enough information available to explain why the observed ratios in Days 13-15 during the Post-Test period are significantly different at the 5% or 10% level. Summing the daily counts for each pest species is of interest since the protocol states that the spiders and roaches were introduced into Room 3 at the same time. Day 3 and Day 4 are marked as "Uncertain" for Testing Period because there is a discrepancy in the original report between the text and the tabulated data for the two pest species.

**QMANN Report# 10275-2; Report Date: 2010-11-20; Model Tested: 50161; aka Feuerstein Deposition Exhibit 22 (= Exhibit 24), Feuerstein-22.pdf (NOTE: TABLE 2 consists of 3 parts: Spiders, Roaches, Spiders+Roaches)**

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TABLE 2. Chi-square analysis of count data reported in QMANN Report No. 10275-2

SPIDERS	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Room 7	6	3	**
PRE-TEST	Room 8(Exit) No Repeller	0	3	0.014305878
Day 2	Room 7	2	2	
PRE-TEST	Room 8(Exit) No Repeller	2	2	1
Day 3	Room 7	10	5	**
PRE-TEST	Room 8(Exit) No Repeller	0	5	0.001565402
Day 4	Room 7	8	5	*
TESTING	Room 8(Exit) No Repeller	2	5	0.057779571
Day 5	Room 7	2	5	*
TESTING	Room 8(Exit) No Repeller	8	5	0.057779571
Day 6	Room 7	0	2	**
TESTING	Room 8(Exit) No Repeller	4	2	0.045500264
Day 7	Room 7	0	3.5	**
TESTING	Room 8(Exit) No Repeller	7	3.5	0.008150972
Day 8	Room 7	1	3.5	*
TESTING	Room 8(Exit) No Repeller	6	3.5	0.058781721
Day 9	Room 7	0	3.5	**
TESTING	Room 8(Exit) No Repeller	7	3.5	0.008150972
Day 10	Room 7	0	3	**
TESTING	Room 8(Exit) No Repeller	6	3	0.014305878
Day 11	Room 7	0	3	**
TESTING	Room 8(Exit) No Repeller	6	3	0.014305878
Day 12	Room 7	0	3	**
TESTING	Room 8(Exit) No Repeller	6	3	0.014305878
Day 13	Room 7	0	0.5	
POST-TEST	Room 8(Exit) No Repeller	1	0.5	0.317310508
Day 14	Room 7	0	0.5	
POST-TEST	Room 8(Exit) No Repeller	1	0.5	0.317310508
Day 15	Room 7	0	0.5	
POST-TEST	Room 8(Exit) No Repeller	1	0.5	0.317310508

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ROACHES	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Room 7	20	10	**
PRE-TEST	Room 8(Exit) No Repeller	0	10	7.74422E-06
Day 2	Room 7	7	6	
PRE-TEST	Room 8(Exit) No Repeller	5	6	0.563702862
Day 3	Room 7	20	10	**
PRE-TEST	Room 8(Exit) No Repeller	0	10	7.74422E-06
Day 4	Room 7	11	8.5	
TESTING	Room 8(Exit) No Repeller	6	8.5	0.225252906
Day 5	Room 7	5	8.5	*
TESTING	Room 8(Exit) No Repeller	12	8.5	0.089555074
Day 6	Room 7	4	9.5	**
TESTING	Room 8(Exit) No Repeller	15	9.5	0.011616891
Day 7	Room 7	5	9	*
TESTING	Room 8(Exit) No Repeller	13	9	0.059346439
Day 8	Room 7	3	8	**
TESTING	Room 8(Exit) No Repeller	13	8	0.012419331
Day 9	Room 7	3	9	**
TESTING	Room 8(Exit) No Repeller	15	9	0.004677735
Day 10	Room 7	11	10.5	
TESTING	Room 8(Exit) No Repeller	10	10.5	0.827259347
Day 11	Room 7	1	7.5	**
TESTING	Room 8(Exit) No Repeller	14	7.5	0.000789113
Day 12	Room 7	0	6.5	**
TESTING	Room 8(Exit) No Repeller	13	6.5	0.000311491
Day 13	Room 7	6	6.5	
POST-TEST	Room 8(Exit) No Repeller	7	6.5	0.781511295
Day 14	Room 7	4	4.5	
POST-TEST	Room 8(Exit) No Repeller	5	4.5	0.73888268
Day 15	Room 7	4	4	
POST-TEST	Room 8(Exit) No Repeller	4	4	1

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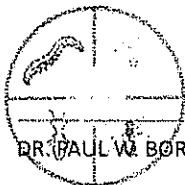
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Spiders+Roaches		Observed	Expected	Chi-Sq P Value
TOTAL		(# Living)	(1/2 of Survivors)	
Day 1	Room 7	26	13	**
PRE-TEST	Room 8(Exit) No Repeller	0	13	3.41417E-07
Day 2	Room 7	9	8	
PRE-TEST	Room 8(Exit) No Repeller	7	8	0.617075077
Day 3	Room 7	30	15	**
PRE-TEST	Room 8(Exit) No Repeller	0	15	4.32046E-08
Day 4	Room 7	19	13.5	**
TESTING	Room 8(Exit) No Repeller	8	13.5	0.034264008
Day 5	Room 7	7	13.5	**
TESTING	Room 8(Exit) No Repeller	20	13.5	0.012354585
Day 6	Room 7	4	11.5	**
TESTING	Room 8(Exit) No Repeller	19	11.5	0.001761702
Day 7	Room 7	5	12.5	**
TESTING	Room 8(Exit) No Repeller	20	12.5	0.002699796
Day 8	Room 7	4	11.5	**
TESTING	Room 8(Exit) No Repeller	19	11.5	0.001761702
Day 9	Room 7	3	12.5	**
TESTING	Room 8(Exit) No Repeller	22	12.5	0.000144696
Day 10	Room 7	11	18.5	**
TESTING	Room 8(Exit) No Repeller	26	18.5	0.013663713
Day 11	Room 7	1	10.5	**
TESTING	Room 8(Exit) No Repeller	20	10.5	3.38127E-05
Day 12	Room 7	0	9.5	**
TESTING	Room 8(Exit) No Repeller	19	9.5	1.30718E-05
Day 13	Room 7	6	7	
POST-TEST	Room 8(Exit) No Repeller	8	7	0.592980098
Day 14	Room 7	4	5	
POST-TEST	Room 8(Exit) No Repeller	6	5	0.527089257
Day 15	Room 7	4	4.5	
POST-TEST	Room 8(Exit) No Repeller	5	4.5	0.73888268

**FROM:**

QMANN Report#: 10275-2; Date:2010-11-20; Model Tested: 50161; Feuerstein-22.pdf; Exhibit 22

**ASTERISK & COLOR LEGEND:**\*\* Chi-Square P Values  $\leq 0.05$ \* Chi-Square P Values  $\leq 0.10$ **Ento-Centric  
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Table 2, Part 1 shows that for spiders the Chi-Square P value is less than 0.05 for six of the nine Testing Days and less than 0.10 for three of the nine Testing Days when the Pest Repeller was ON and testing was underway. Therefore, for these nine days, we cannot accept the null hypothesis. In other words, the observed ratio of spiders IN ROOM 7:IN ROOM 8 deviates significantly from the hypothesized no-preference ratio of 1:1 at the 5% or 10% level of significance for these days. These significant differences suggest that the Pest Repeller did demonstrate efficacy under the conditions in which it was tested. The significantly different ratios in Days 1 and 3 during the Pre-Test are likely artifacts of the protocol and introduction/acclimation of spiders to the testing rooms.

Table 2, Part 2 shows that for roaches the Chi-Square P value is less than 0.05 for five of the nine Testing Days and less than 0.10 for two of the nine Testing Days when the Pest Repeller was ON and testing was underway. Therefore, for these seven days, we cannot accept the null hypothesis. In other words, the observed ratio of roaches IN ROOM 7:IN ROOM 8 deviates significantly from the hypothesized no-preference ratio of 1:1 at the 5% or 10% level of significance for these days. These significant differences suggest that the Pest Repeller did demonstrate efficacy under the conditions in which it was tested. The significant observed ratios on Day 1 and Day 3 of the Pre-Test are likely artifacts of the protocol and introduction/acclimation of the roaches to the testing rooms. Clearly, the non-significant observed ratio on Day 10 of testing appears to be an anomaly. The non-significant ratios during all days of the Post-Test are expected since the Pest Repeller was turned off, and the roaches responded by showing no preference for either Room 7 or Room 8.

Table 2, Part 3 shows that when the counts for spiders and roaches are summed for each day the Chi-Square P Value is less than 0.05 for all days when Testing was underway and the Pest Repeller was ON (Days 4-12). Therefore, for these nine days, we cannot accept the null hypothesis. In other words, the observed ratio of spiders + roaches IN ROOM 7:IN ROOM 8 deviates significantly from the hypothesized no-preference ratio of 1:1 at the 5% level of significance for these days. These significant differences suggest that the Pest Repeller did demonstrate efficacy under the conditions in which it was tested. The non-significant ratios during all days of the Post-Test are expected since the Pest Repeller was turned off, and the spiders and roaches responded by showing no preference for either Room 7 or Room 8. Summing the daily counts for each pest species is of interest since the protocol states that the spiders and roaches were introduced into Room 7 at the same time.

SGS Report#: SZXWT00603439; Date: 23-MAR-2012; Model Tested: not stated; BHH, LLC.000022-000039. (NOTE: Table 4 consists of four parts: Spiders, Ants, Roaches, Ants+Roaches)

TABLE 3. Chi-square analysis of count data reported in SGS Report No. SZXWT00603439

SPIDERS	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	10	10	
PRE-TEST	Chamber B (No Repeller)	10	10	1
Day 2	Chamber A	10	10	
PRE-TEST	Chamber B (No Repeller)	10	10	1
Day 3	Chamber A	1	10	**
TESTING	Chamber B (No Repeller)	19	10	5.69941E-05
Day 4	Chamber A	2	10	**
TESTING	Chamber B (No Repeller)	18	10	0.000346619
Day 5	Chamber A	1	10	**
TESTING	Chamber B (No Repeller)	19	10	5.69941E-05
Day 6	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 7	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 8	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 9	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 10	Chamber A	8	10	
POST-TEST	Chamber B (No Repeller)	12	10	0.37109337
Day 11	Chamber A	11	10	
POST-TEST	Chamber B (No Repeller)	9	10	0.654720846

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ANTS	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	10	10	
PRE-TEST	Chamber B (No Repeller)	10	10	1
Day 2	Chamber A	10	10	
PRE-TEST	Chamber B (No Repeller)	10	10	1
Day 3	Chamber A	1	10	**
TESTING	Chamber B (No Repeller)	19	10	5.69941E-05
Day 4	Chamber A	1	10	**
TESTING	Chamber B (No Repeller)	19	10	5.69941E-05
Day 5	Chamber A	1	10	**
TESTING	Chamber B (No Repeller)	19	10	5.69941E-05
Day 6	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 7	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 8	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 9	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 10	Chamber A	8	10	
POST-TEST	Chamber B (No Repeller)	12	10	0.37109337
Day 11	Chamber A	9	10	
POST-TEST	Chamber B (No Repeller)	11	10	0.654720846

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ROACHES	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	7	10	
PRE-TEST	Chamber B (No Repeller)	13	10	0.179712495
Day 2	Chamber A	10	10	
PRE-TEST	Chamber B (No Repeller)	10	10	1
Day 3	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 4	Chamber A	2	10	**
TESTING	Chamber B (No Repeller)	18	10	0.000346619
Day 5	Chamber A	1	10	**
TESTING	Chamber B (No Repeller)	19	10	5.69941E-05
Day 6	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 7	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 8	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 9	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 10	Chamber A	11	10	
POST-TEST	Chamber B (No Repeller)	9	10	0.654720846
Day 11	Chamber A	8	10	
POST-TEST	Chamber B (No Repeller)	12	10	0.37109337

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Ants+Roaches TOTAL	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	17	20	
PRE-TEST	Chamber B (No Repeller)	23	20	0.342781711
Day 2	Chamber A	20	20	
PRE-TEST	Chamber B (No Repeller)	20	20	1
Day 3	Chamber A	1	20	**
TESTING	Chamber B (No Repeller)	39	20	1.87447E-09
Day 4	Chamber A	3	20	**
TESTING	Chamber B (No Repeller)	37	20	7.62129E-08
Day 5	Chamber A	2	20	**
TESTING	Chamber B (No Repeller)	38	20	1.25486E-08
Day 6	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 7	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 8	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 9	Chamber A	0	10	**
TESTING	Chamber B (No Repeller)	20	10	7.74422E-06
Day 10	Chamber A	19	20	
POST-TEST	Chamber B (No Repeller)	21	20	0.751829634
Day 11	Chamber A	17	20	
POST-TEST	Chamber B (No Repeller)	23	20	0.342781711

**FROM:**

SGS Report#: SZXWT00603439; Date: 23-Mar-2012; Model Tested: not stated; Efficacy Reports

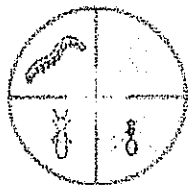
**ASTERISK & COLOR LEGEND:**\*\* Chi-Square P Values  $\leq 0.05$ \* Chi-Square P Values  $\leq 0.10$ **Ento-Centric  
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Table 3, Parts 1, 2, 3, and 4 all show that the Chi-Square P value is less than 0.05 for spiders, ants, roaches, and ants+roaches, respectively, on all days when Testing was underway and the Pest Repeller

Page 14 of 30

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was ON (Days 3-9). Therefore, we cannot accept the null hypothesis for any of the pests on any of the days when the Pest Repeller was ON (this equals 28 independent chi-square tests (7 days x 4 pests)). In other words, the observed ratio of any pest or pest combination IN CHAMBER A:IN CHAMBER B deviates significantly from the hypothesized no-preference ratio of 1:1 at the 5% level of significance for these days. These significant differences suggest that the Pest Repeller did demonstrate efficacy under the conditions in which it was tested for spiders, ants, roaches and ants+roaches. The non-significant ratios during all days of the Post-Test are expected since the Pest Repeller was turned off, and the pests showed no preference for either Chamber A or Chamber B. Summing the daily counts for the Ants and Roaches is of interest since the protocol states that these two pests were introduced into Chamber A at the same time.

**Intertek Report#: 140515021GXU-002; Date: July 7, 2014; Model Tested: not stated; BHH, LLC.000042-000052. NOTE: Table 4 consists of four parts: Spiders, Roaches, Ants, Spiders+Roaches+Ants.**

Page 15 of 30

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TABLE 4. Chi-square analysis of count data reported in Intertek Report # 140515021GZU-002

SPIDERS	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	3	5	
PRE-TEST	Chamber B (No Repeller)	7	5	0.205903211
Day 2	Chamber A	3	5	
PRE-TEST	Chamber B (No Repeller)	7	5	0.205903211
Day 3	Chamber A	3	5	
TESTING	Chamber B (No Repeller)	7	5	0.205903211
Day 4	Chamber A	1	5	**
TESTING	Chamber B (No Repeller)	9	5	0.011412036
Day 5	Chamber A	2	5	*
TESTING	Chamber B (No Repeller)	8	5	0.057779571
Day 6	Chamber A	1	5	**
TESTING	Chamber B (No Repeller)	9	5	0.011412036
Day 7	Chamber A	1	5	**
TESTING	Chamber B (No Repeller)	9	5	0.011412036
Day 8	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 9	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 10	Chamber A	3	5	
POST-TEST	Chamber B (No Repeller)	7	5	0.205903211
Day 11	Chamber A	4	5	
POST-TEST	Chamber B (No Repeller)	6	5	0.527089257

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ROACHES	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	7	5	
PRE-TEST	Chamber B (No Repeller)	3	5	0.205903211
Day 2	Chamber A	6	5	
PRE-TEST	Chamber B (No Repeller)	4	5	0.527089257
Day 3	Chamber A	5	5	
TESTING	Chamber B (No Repeller)	5	5	1
Day 4	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 5	Chamber A	1	5	**
TESTING	Chamber B (No Repeller)	9	5	0.011412036
Day 6	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 7	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 8	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 9	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 10	Chamber A	2	5	*
POST-TEST	Chamber B (No Repeller)	8	5	0.057779571
Day 11	Chamber A	5	5	
POST-TEST	Chamber B (No Repeller)	5	5	1

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ANTS	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	4	5	
PRE-TEST	Chamber B (No Repeller)	6	5	0.527089257
Day 2	Chamber A	6	5	
PRE-TEST	Chamber B (No Repeller)	4	5	0.527089257
Day 3	Chamber A	4	5	
TESTING	Chamber B (No Repeller)	6	5	0.527089257
Day 4	Chamber A	1	5	**
TESTING	Chamber B (No Repeller)	9	5	0.011412036
Day 5	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 6	Chamber A	1	5	**
TESTING	Chamber B (No Repeller)	9	5	0.011412036
Day 7	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 8	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 9	Chamber A	0	5	**
TESTING	Chamber B (No Repeller)	10	5	0.001565402
Day 10	Chamber A	6	5	
POST-TEST	Chamber B (No Repeller)	4	5	0.527089257
Day 11	Chamber A	7	5	
POST-TEST	Chamber B (No Repeller)	3	5	0.205903211

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**Spiders+Ants+****Roaches**

TOTAL	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	14	15	
PRE-TEST	Chamber B	16	15	0.715000655
Day 2	Chamber A	15	15	
PRE-TEST	Chamber B (No Repeller)	15	15	1
Day 3	Chamber A	12	15	
TESTING	Chamber B (No Repeller)	18	15	0.273321678
Day 4	Chamber A	2	15	**
TESTING	Chamber B (No Repeller)	28	15	2.06529E-06
Day 5	Chamber A	3	15	**
TESTING	Chamber B (No Repeller)	27	15	1.17713E-05
Day 6	Chamber A	2	15	**
TESTING	Chamber B (No Repeller)	28	15	2.06529E-06
Day 7	Chamber A	1	15	**
TESTING	Chamber B (No Repeller)	29	15	3.18636E-07
Day 8	Chamber A	0	15	**
TESTING	Chamber B (No Repeller)	30	15	4.32046E-08
Day 9	Chamber A	0	15	**
TESTING	Chamber B (No Repeller)	30	15	4.32046E-08
Day 10	Chamber A	11	15	
POST-TEST	Chamber B (No Repeller)	19	15	0.144127035
Day 11	Chamber A	16	15	
POST-TEST	Chamber B (No Repeller)	14	15	0.715000655

**FROM:**

Intertek Report#: 14051502GZU-002; Date: July 7, 2014; Model Tested: not stated; Efficacy Reports.pdf

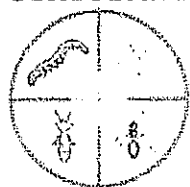
**ASTERISK & COLOR LEGEND:**\*\* Chi-Square P Values  $\leq 0.05$ \* Chi-Square P Values  $\leq 0.10$ **Ento-Centric  
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Table 4, Parts 1, 2, 3, and 4 all show that the Chi-Square P value is less than 0.05 for spiders, roaches, ants, and spiders+ants+roaches, respectively, on six of the seven days when Testing was underway and

Page 19 of 30

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the Pest Repeller was ON (Days 4-9) [one P value is less than 0.10, not 0.05]. Therefore, for these six days, we cannot accept the null hypothesis for any of the pests (this equals 24 independent chi-square tests (6 days x 4 pests)). In other words, the observed ratio of any pest or pest combination IN CHAMBER A:IN CHAMBER B deviates significantly from the hypothesized no-preference ratio of 1:1 at the 5% level of significance for these days. These significant differences suggest that the Pest Repeller did demonstrate efficacy under the conditions in which it was tested for spiders, ants, roaches and ants+roaches. The only testing day in which the observed ratio was not significantly different from the expected was the first day of testing (Day 3) which was similar and non-significant, just as the two Pre-Test days that preceded it (Days 1 and 2). The non-significant ratios during the Post-Test days are expected since the Pest Repeller was turned off, and the pests showed no preference for either Chamber A or Chamber B. Summing the daily counts for the Spiders, Ants and Roaches is of interest since the protocol states that all pests were introduced into Chamber A at the same time.

Intertek Report#: 160419051GZU-002; Date: April 7, 2016; Model Tested: 50167 (from photo on p. 2); 160419051GZU-002.pdf. NOTE: Table 5 consists of four parts: Spiders, Ants, Roaches, Spiders+Roaches+Ants.

TABLE 5. Chi-square analysis of count data reported in Intertek Report No. 16041905GZU-002

SPIDERS	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	9	9.5	
PRE-TEST	Chamber B (No Repeller)	10	9.5	0.818545808
Day 2	Chamber A	8	10	
PRE-TEST	Chamber B (No Repeller)	12	10	0.37109337
Day 3	Chamber A	8	10	
TESTING	Chamber B (No Repeller)	12	10	0.37109337
Day 4	Chamber A	6	10	*
TESTING	Chamber B (No Repeller)	14	10	0.07363827
Day 5	Chamber A	6	10	*
TESTING	Chamber B (No Repeller)	14	10	0.07363827
Day 6	Chamber A	2	9	**
TESTING	Chamber B (No Repeller)	16	9	0.000967428
Day 7	Chamber A	3	9	**
TESTING	Chamber B (No Repeller)	15	9	0.004677735
Day 8	Chamber A	2	8.5	**
TESTING	Chamber B (No Repeller)	15	8.5	0.001616222
Day 9	Chamber A	2	10	**
TESTING	Chamber B (No Repeller)	18	10	0.000346619
Day 10	Chamber A	7	10	
POST-TESTING	Chamber B (No Repeller)	13	10	0.179712495
Day 11	Chamber A	8	10	
POST-TESTING	Chamber B (No Repeller)	12	10	0.37109337

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ANTS	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	8	9	
PRE-TEST	Chamber B (No Repeller)	10	9	0.637351888
Day 2	Chamber A	9	10	
PRE-TEST	Chamber B (No Repeller)	11	10	0.654720846
Day 3	Chamber A	7	10	
TESTING	Chamber B (No Repeller)	13	10	0.179712495
Day 4	Chamber A	6	10	*
TESTING	Chamber B (No Repeller)	14	10	0.07363827
Day 5	Chamber A	6	10	*
TESTING	Chamber B (No Repeller)	14	10	0.07363827
Day 6	Chamber A	5	9.5	**
TESTING	Chamber B (No Repeller)	14	9.5	0.038947456
Day 7	Chamber A	5	8	
TESTING	Chamber B (No Repeller)	11	8	0.133614403
Day 8	Chamber A	6	10	*
TESTING	Chamber B (No Repeller)	14	10	0.07363827
Day 9	Chamber A	6	10	*
TESTING	Chamber B (No Repeller)	14	10	0.07363827
Day 10	Chamber A	6	10	*
POST-TESTING	Chamber B (No Repeller)	14	10	0.07363827
Day 11	Chamber A	9	10	
POST-TESTING	Chamber B (No Repeller)	11	10	0.654720846

ROACHES	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	8	8.5	
PRE-TEST	Chamber B (No Repeller)	9	8.5	0.808365156
Day 2	Chamber A	9	9	
PRE-TEST	Chamber B (No Repeller)	9	9	1
Day 3	Chamber A	9	10	
TESTING	Chamber B (No Repeller)	11	10	0.654720846
Day 4	Chamber A	5	10	**
TESTING	Chamber B (No Repeller)	15	10	0.025347319
Day 5	Chamber A	3	8.5	**
TESTING	Chamber B (No Repeller)	14	8.5	0.007632882
Day 6	Chamber A	4	8	**
TESTING	Chamber B (No Repeller)	12	8	0.045500264
Day 7	Chamber A	3	7.5	**
TESTING	Chamber B (No Repeller)	12	7.5	0.020136752
Day 8	Chamber A	5	10	**
TESTING	Chamber B (No Repeller)	15	10	0.025347319
Day 9	Chamber A	4	10	**
TESTING	Chamber B (No Repeller)	16	10	0.007290358
Day 10	Chamber A	7	10	
POST-TESTING	Chamber B (No Repeller)	13	10	0.179712495
Day 11	Chamber A	8	10	
POST-TESTING	Chamber B (No Repeller)	12	10	0.37109337

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Spiders+Roaches+ Ants		Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
TOTAL	Location			
Day 1	Chamber A	25	27	
PRE-TEST	Chamber B (No Repeller)	29	27	0.586213681
Day 2	Chamber A	26	29	
PRE-TEST	Chamber B (No Repeller)	32	29	0.430791121
Day 3	Chamber A	24	30	
TESTING	Chamber B (No Repeller)	36	30	0.12133525
Day 4	Chamber A	17	30	**
TESTING	Chamber B (No Repeller)	43	30	0.000789113
Day 5	Chamber A	15	29	**
TESTING	Chamber B (No Repeller)	43	29	0.000236382
Day 6	Chamber A	11	26.5	**
TESTING	Chamber B (No Repeller)	42	26.5	2.061E-05
Day 7	Chamber A	11	24.5	**
TESTING	Chamber B (No Repeller)	38	24.5	0.00011472
Day 8	Chamber A	13	28.5	**
TESTING	Chamber B (No Repeller)	44	28.5	4.02482E-05
Day 9	Chamber A	12	30	**
TESTING	Chamber B (No Repeller)	48	30	3.35852E-06
Day 10	Chamber A	20	31.5	**
POST-TESTING	Chamber B (No Repeller)	43	31.5	0.003758769
Day 11	Chamber A	25	30	
POST-TESTING	Chamber B (No Repeller)	35	30	0.196705602

**FROM:**

Intertek Report#: 160419051GZU-002; Date: May 25, 2016; Model Tested: S0167; 160419051GZU-002.pdf

**ASTERISK & COLOR LEGEND:**\*\* Chi-Square P Values  $\leq 0.05$ \* Chi-Square P Values  $\leq 0.10$ **Ento-Centric  
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Table 5, Parts 1, 2, 3, and 4 all show that the Chi-Square P value is less than 0.05 or 0.10 for spiders, ants, roaches, and spiders+ants+roaches, respectively, on six of the seven days when Testing was underway

Page 24 of 30

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and the Pest Repeller was ON (Days 4-9). Note that one anomalous P value is greater than 0.10 (ants on Day 7) and the report does not offer an explanation for this this aberration. Therefore, over six of the seven days of testing, we cannot accept the null hypothesis for any of the pests or pest combinations. This equals 23 independent chi-square tests ((6 days x 4 pests) – 1 anomaly). In other words, the observed ratio of any pest or pest combination IN CHAMBER A:IN CHAMBER B deviates significantly from the hypothesized no-preference ratio of 1:1 at the 5% or 10% level of significance for these days. These significant differences suggest that the Pest Repeller did demonstrate efficacy under the conditions in which it was tested for spiders, ants, roaches and spiders+ants+roaches. The only testing day in which the observed ratio was not significantly different from the expected ratio was the first day of testing (Day 3) which was similar and non-significant, just as the two Pre-Test days that preceded it (Days 1 and 2). The non-significant ratios during the Post-Test days are expected since the Pest Repeller was turned off, and the pests showed no preference for either Chamber A or Chamber B, though ants still showed a significant preference ( $P \leq 0.10$ ) for Chamber B for one Post-Test day. Summing the daily counts for the Spiders, Ants and Roaches is of interest since the protocol states that all pests were introduced into Chamber A at the same time.

SGS Report#: AFL20160214GZ-2; Date: May 25, 2016; Model Tested: not stated; SGS-AFL20160214GZ-2 Testing Witness Report Confirm. NOTE: Table 6 consists of four parts: Ants, Spiders, Roaches, Ants+Spiders+Roaches.

TABLE 6. Chi-square analysis of count data reported in SGS Report No. AFL20160214GZ-2

ANTS	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	6	8.5	
PRE-TEST	Chamber B (No Repeller)	11	8.5	0.225252906
Day 2	Chamber A	3	8.5	**
PRE-TEST	Chamber B (No Repeller)	14	8.5	0.007632882
Day 3	Chamber A	3	10	**
TESTING	Chamber B (No Repeller)	17	10	0.001745119
Day 4	Chamber A	5	9	*
TESTING	Chamber B (No Repeller)	13	9	0.059346439
Day 5	Chamber A	2	10	**
TESTING	Chamber B (No Repeller)	18	10	0.000346619
Day 6	Chamber A	2	8.5	**
TESTING	Chamber B (No Repeller)	15	8.5	0.001616222
Day 7	Chamber A	2	5	*
TESTING	Chamber B (No Repeller)	8	5	0.057779571
Day 8	Chamber A	3	8.5	**
TESTING	Chamber B (No Repeller)	14	8.5	0.007632882
Day 9	Chamber A	3	10	**
TESTING	Chamber B (No Repeller)	17	10	0.001745119
Day 10	Chamber A	2	10	**
POST-TEST	Chamber B (No Repeller)	18	10	0.000346619
Day 11	Chamber A	2	10	**
POST-TEST	Chamber B (No Repeller)	18	10	0.000346619

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SPIDERS	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	8	8.5	
PRE-TEST	Chamber B (No Repeller)	9	8.5	0.808365156
Day 2	Chamber A	9	10	
PRE-TEST	Chamber B (No Repeller)	11	10	0.654720846
Day 3	Chamber A	6	10	*
TESTING	Chamber B (No Repeller)	14	10	0.07363827
Day 4	Chamber A	5	10	**
TESTING	Chamber B (No Repeller)	15	10	0.025347319
Day 5	Chamber A	6	10	*
TESTING	Chamber B (No Repeller)	14	10	0.07363827
Day 6	Chamber A	5	7.5	
TESTING	Chamber B (No Repeller)	10	7.5	0.196705602
Day 7	Chamber A	7	8	
TESTING	Chamber B (No Repeller)	9	8	0.617075077
Day 8	Chamber A	1	10	**
TESTING	Chamber B (No Repeller)	19	10	5.69941E-05
Day 9	Chamber A	2	10	**
TESTING	Chamber B (No Repeller)	18	10	0.000346619
Day 10	Chamber A	1	10	**
POST-TEST	Chamber B (No Repeller)	19	10	5.69941E-05
Day 11	Chamber A	1	10	**
POST-TEST	Chamber B (No Repeller)	19	10	5.69941E-05

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ROACHES	Location	Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
Day 1	Chamber A	5	9	*
PRE-TEST	Chamber B (No Repeller)	13	9	0.059346439
Day 2	Chamber A	5	8	
PRE-TEST	Chamber B (No Repeller)	11	8	0.133614403
Day 3	Chamber A	6	9	
TESTING	Chamber B (No Repeller)	12	9	0.157299207
Day 4	Chamber A	2	8	**
TESTING	Chamber B (No Repeller)	14	8	0.002699796
Day 5	Chamber A	5	10	**
TESTING	Chamber B (No Repeller)	15	10	0.025347319
Day 6	Chamber A	6	8	
TESTING	Chamber B (No Repeller)	10	8	0.317310508
Day 7	Chamber A	2	5.5	**
TESTING	Chamber B (No Repeller)	9	5.5	0.034808479
Day 8	Chamber A	4	9	**
TESTING	Chamber B (No Repeller)	14	9	0.018422125
Day 9	Chamber A	4	10	**
TESTING	Chamber B (No Repeller)	16	10	0.007290358
Day 10	Chamber A	5	10	**
POST-TEST	Chamber B (No Repeller)	15	10	0.025347319
Day 11	Chamber A	6	10	*
POST-TEST	Chamber B (No Repeller)	14	10	0.07363827

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Ants+Spiders+Roaches		Observed (# Living)	Expected (1/2 of Survivors)	Chi-Sq P Value
TOTAL	Location			
Day 1	Chamber A	19	26	*
PRE-TEST	Chamber B (No Repeller)	33	26	0.052203635
Day 2	Chamber A	17	26.5	**
PRE-TEST	Chamber B (No Repeller)	36	26.5	0.009058174
Day 3	Chamber A	15	29	**
TESTING	Chamber B (No Repeller)	43	29	0.000236382
Day 4	Chamber A	12	27	**
TESTING	Chamber B (No Repeller)	42	27	4.45571E-05
Day 5	Chamber A	13	30	**
TESTING	Chamber B (No Repeller)	47	30	1.13674E-05
Day 6	Chamber A	13	24	**
TESTING	Chamber B (No Repeller)	35	24	0.001496164
Day 7	Chamber A	11	18.5	**
TESTING	Chamber B (No Repeller)	26	18.5	0.013663713
Day 8	Chamber A	8	27.5	**
TESTING	Chamber B (No Repeller)	47	27.5	1.45031E-07
Day 9	Chamber A	9	30	**
TESTING	Chamber B (No Repeller)	51	30	5.88776E-08
Day 10	Chamber A	8	30	**
POST-TEST	Chamber B (No Repeller)	52	30	1.34399E-08
Day 11	Chamber A	9	30	**
POST-TEST	Chamber B (No Repeller)	51	30	5.88776E-08

**FROM:**

SGS Report#: AFL20160214GZ-2; Date: May 25, 2016; Model Tested: not stated; SGS-AFL20160214GZ-2-Testing Witness Report Conf

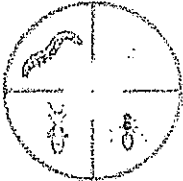
**ASTERISK & COLOR LEGEND:**\*\* Chi-Square P Values  $\leq 0.05$ \* Chi-Square P Values  $\leq 0.10$ **Ento-Centric  
CONSULTING**

Table 6, Part 1 (Ants) shows that the Chi-Square P Value is less than 0.05 or 0.10 for all of the days in the study except for the very first, Pre-Test Day 1. Therefore, we cannot accept the null hypothesis, for any

Page 29 of 30

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SOLVING PROBLEMS AT THE NEXUS OF SCIENCE, BUSINESS, AND EDUCATION

of those days (Days 2-11). In other words, the observed ratio of ants IN CHAMBER A:IN CHAMBER B for Days 2-11 deviates significantly from the hypothesized no-preference ratio of 1:1 at the 5% or 10% level of significance. Further examination of the count data shows that the ants preferred Chamber B (No Repeller) on every day -- even Day 1. Clearly, the count data and chi-square analysis suggests that there was a bias toward Chamber B (No Repeller) since there were always more ants in that chamber whether the Repeller was on or off, and regardless of Testing Phase. The investigators make no mention of attempts to pursue or correct for the causative agent of this apparent experimental error.

Table 6, Parts 2, 3, and naturally 4 (since it is the result of the sum of all pests), shows the same pattern as described in Table 6, Part 1, though to a lesser extent. The Spider counts and Roach counts are greater in Chamber B (No Repeller), and most of the cases are significant at the 0.05 or 0.10 level of significance, regardless of Day or Testing Phase. The investigators make no mention of attempts to pursue or correct for the causative agent for the apparent bias in favor of Chamber B.

For the reasons cited above, this SGS report will not be used in any further analysis or discussion of the efficacy of the Pest Repeller.

**Conclusion:** Across all five efficacy research reports (Report #6 was disqualified) a total of 221 chi-square tests for independence were run. Of most import in this matter is the subset of results arising from the chi-square tests on the days labeled as TESTING by the researchers, as these were the days when the Pest Repeller was ON in one of the testing arenas. When considering all TESTING days, across all experiments, all pests and all pest combinations a total of 136 chi-square tests were run to test the null hypothesis of "no preference". Regardless of the experiment, pest, pest combination, the null hypothesis was rejected at the 5% or 10% level of significance for 124 of the 136 testing days (rejected 91% of the time). Therefore, I conclude that: Based upon the conditions in which the Pest Repellers were used in these five choice experiments and using the data reported in the associated research reports, the Pest Repellers can be classified as "efficacious" with a reasonable amount of certainty, given that efficacy is defined as the affectation of pest behavior such that there is a disproportionate number of pests found in an adjoining arena where there is no Pest Repeller.

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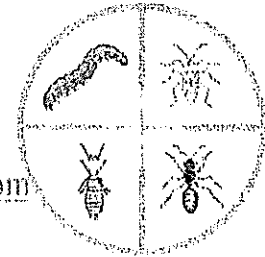
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Preferred e-mail: [pwborth@Ento-CentricConsulting.com](mailto:pwborth@Ento-CentricConsulting.com)**Professional R&D Leadership and Entomological Industry Experience**

**Paul W Borth Consulting, LLC dba Ento-Centric Consulting:** Post-retirement start-up business as an independent contractor/consultant leveraging and extending the multi-discipline scientific and management experience acquired as former employee of a major agricultural/urban pest management corporation and educational institutions. Specializing in a) agricultural and urban pest management analysis and problem-solving, troubleshooting, and forecasting consulting, b) expert witnessing/litigation consulting, c) professional workshop design, development and facilitation, d) strategy development and project management, e) technical training, writing and editing.

**2015 - Present Principal**

- Engaged as Expert Witness in two class action litigation matters
- Designed, developed and facilitated the 2.5 day workshop. "Implementing the Pesticide Drift Reduction Technologies Verification Protocol: An Industry Workshop" hosted by the University of Nebraska, Lincoln
- Consulted with investment firms on present and future of the U.S. agricultural market, urban pest services and termite markets
- Retained as freelance consultant for privately-held Pest Control company
- Ghost-writer for research and trade magazine articles

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**Dow AgroSciences:** 27+ years of professional R&D experience in a diversity of impactful program and people leadership roles, advancing to Research Fellow status. Specialized in starting up, leading and coordinating global, national and regional research programs across all crop protection disciplines to address priority market needs. Demonstrated skills and aptitude for cross-functional strategy development and execution, technical leadership, people management, product development and career path flexibility and versatility.



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- 2012 - 2015      Leader, Discovery Phase Technology Center and Learning & Effectiveness Center**
- Created infrastructure and operating discipline for two start-up Technology Centers
  - Led global R&D teams to characterize >xx early stage ag chemicals (insecticides, fungicides, herbicides) and traits (IR/HT) across target pests in commodity and specialty crops
  - Developed and led implementation of multi-generational strategic plan to increase research capabilities and capacity across global network of ~25 scientists and research field stations
  - Led team in tracking, trending and forecasting expenditures against a multi-million dollar annual R&D budget and global cost centers
  - Conducted global Voice-of-Customer sessions transforming output into actionable short- and long-term Learning strategies
  - Employed Six Sigma methodology to streamline and optimize complex cross-functional work processes
- 2008 – 2012      Leader, Delivery Systems Technology Center**
- Created Center infrastructure, operating discipline and project prioritization scheme for scientists researching novel, proprietary formulations and agricultural chemical delivery systems
  - Transformed environmentally desirable attributes into research objectives and key questions for formulation scientists
  - Served as point-of-contact and confidentiality agreement negotiator for external firms seeking research collaborations
- 2003 – 2008      R&D Leader (3 roles) in Global and U.S. Urban Pest Management and Turf & Ornamental Division**
- Oversight and ultimate management accountability for all R&D projects, budgets, and people supporting the UPM/T&O businesses including current portfolio and strategic initiatives to define and build the future product and service portfolio (e.g., bed bug, termite, cockroach, ants, etc.)
  - Led efficacy and environmental safety research in field, greenhouse, lab on proprietary and generic ag chemicals and formulations in the specialty crops market, e.g., chlorpyrifos, spinosad, methoxyfenozide, myclobutanil, fenarimol, manozebl, oxyfluorfen, dithiopyr, tebuthiuron
- 1998 – 2003      Human Resources Manager (2 roles) in R&D and Commercial functions**

- Demonstrated interpersonal effectiveness skills in managing and implementing all HR People Processes for ~200 scientists in Discovery, IT, Formulation Science & Technology and Six Sigma functions
- Developed and led integrated Business and Technical Training strategy and implementation program for new hires and veteran commercial employees

**1990 – 1998 National R&D Leader (2 roles) in Crop Protection division**

- As U.S. Technical Leader, coordinated and managed insecticide, herbicide and fungicide research programs to support existing and new product commercialization across diversity of crops
- Learned and implemented effective virtual team leadership tactics
- Developed new products/label extensions for spinosad, chlorpyrifos, fenarimol, and diclosulam in the commodity and specialty crops markets

**1987 – 1990 U.S. Regional Technical Service & Development Specialist**

- Performed in-field research on all insecticides in 3-state territory
- Collaborated with regional university Centers of Influence
- Provided technical support for regional sales management and employees

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**University of Arizona:** Six years total comprised of a) three years influencing growers and homeowners through field research/demonstrations and multiple communication venues to adopt IPM tactics in their agri-business and homes, followed by b) three+ years in the Graduate School, Department of Entomology with responsibility for lab and field research personnel and multiple research projects – leading to a Ph.D. in Entomology.

**1984 – 1987 Graduate Research Assistant, Department of Entomology, University of Arizona**

- Developed and executed field- and lab-based research in support of Ph.D. dissertation, *“Traditional and geostatistical modeling of pink bollworm spatial dynamics in Arizona cotton with application to sampling and computer mapping”*

**1981 – 1984 IPM Specialist, Department of Entomology, Cooperative Extension Service, University of Arizona, Tucson**

- Developed and delivered IPM programs in western Arizona, with emphasis on local agricultural systems, e.g., cotton, citrus, lettuce, cole crops, alfalfa

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**University of Maryland:** Three years in the Graduate School, Department of Entomology instructing undergraduate and graduate level entomology while pursuing a research-based Master's degree in Entomology.

**1978 – 1981      Graduate Teaching Assistant, Department of Entomology, University of Maryland, College Park**

- Taught lab sections of Applied Entomology courses, Insect Physiology, and Insect Taxonomy
- Developed and executed field- and lab-based research in support of M.S. thesis, "*The seasonal abundance and spatial distribution of the tobacco hornworm, Manduca sexta (L.), and tomato hornworm, M. quinquemaculata (Haworth) in southern Maryland tobacco*"

**Other Work Experience**

**1975 – 1978      High School Science Teacher, Baltimore Lutheran High School, Towson, Maryland (now, Concordia Preparatory School)**

- Curriculum development and classroom delivery of General Science, Biology and Advanced Biology courses

**Professional Certification, Society Leadership and Volunteerism**

**Board Certified Entomologist (BCE), 1983– present, License # B1799**

- Organizer, Co-organizer, BCE National symposium, 1995, 1999, 2000
- Reviewer, BCE Qualifying Exam Committee
- BCE Education Committee

**Entomological Society of America, 1978 – present**

- Science Policy Presidential Committee member, 2012 – 2013
- 2010 President, Plant-Insect Ecosystems Section
  - Elected officer, ~2600 members
  - 2008 – 2011 Presidential succession line
- Secretary, Section F (Crop Protection), 2006 – 2007
- Chair, ESA Standing Committee on Ethics, 2002 – 2003
- ESA, North Central Branch Nominating Committee
- Chair, ESA Student Affairs Committee
- Co-Author, ESA White Paper, "*Prescription pest management*"
- Section F Representative, ESA Education and Youth Standing Committee

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**The Entomological Foundation, Board of Directors, 2001 – 2006**

- Secretary, 2005 – 2006
- President and Chair, 2003 – 2005 (two elected terms)
- Vice President, 2002 – 2003
- Chair, Strategic Planning Task Force, 2002
- Nominating Committee, 2001 - 2002

**Brief Scientific Publication and Presentation Record**

- Author/co-author of six full, refereed papers published in Journal of Economic Entomology, Environmental Entomology, Ecological Applications, American Entomologist, Graduate Schools of University of Maryland and University of Arizona
- Author/co-author of 25+ significant non-refereed publication and conference proceedings
- Presenter of 60+ invited and submitted oral and poster presentations for ESA national and branch meetings, symposia, conferences, grower association meetings, pest control association meetings
- Author/Co-author of numerous internal research and strategy reports
- Co-inventor, six Urban Pest Management market patents
  - U.S. 7,743,552 B2, U.S. 7,905,048 B2, U.S. 8,375,626 B2, U.S. 8,661,728, B2: Bedbug Detection, Monitoring and Control Techniques
  - U.S. 8,026,822 B2, U.S. 8,830,071 B2: Networked Pest Control System

**Formal Education**

|       |                                               |                                                                                     |      |
|-------|-----------------------------------------------|-------------------------------------------------------------------------------------|------|
| Ph.D. | Entomology (Major)<br>Plant Pathology (Minor) | University of Arizona, Tucson, AZ                                                   | 1987 |
| ~ ~ ~ |                                               |                                                                                     |      |
| M.S.  | Entomology (Major)<br>Biometrics (Minor)      | University of Maryland, College Park, MD                                            | 1981 |
| ~ ~ ~ |                                               |                                                                                     |      |
| B.A.  | Education (Major)<br>Natural Sciences (Minor) | Concordia Teachers College, River Forest, IL<br>(now Concordia University, Chicago) | 1975 |

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